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The *Western Undergraduate Economics Review* is an annual publication containing papers written by undergraduate students in Economics at Western. First published in 2002, the *Review* reflects the academic distinction and creativity of the Economics Department at Western. By showcasing some of the finest work of our students, it bestows on them a lasting honour and a sense of pride. Moreover, publication in the *Review* is highly beneficial to the students as they continue their studies or pursue other activities after graduation. For many, it is their first publication, and the experience of becoming a published author is a highlight of their undergraduate career. The *Review* is a collaborative effort of the students, faculty, and staff of the Economics Department. All papers submitted to the *Review* are essays written for courses taken in the Department. Some are by students in the early stages of their Economics studies, while others are papers written by senior students for the Department's unique thesis course, Economics 4400. Selections are made by the edition editors, in consultation with a faculty advisor, based on creativity, academic merit, and the written quality of the article.

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Editors' Comments

We are pleased to present the 2015 edition of the *Western Undergraduate Economics Review*, which once again showcases a variety of high caliber work completed by Western's Undergraduate Economics students. This year, the *Review* includes a collection of papers that provide important conclusions for economic policy both in Canada and around the world.

The 2015 *Review* opens with the winner of the Mark K. Inman Senior Essay Prize written by Lorayne Mercado and Saad Usmani, an examination of the decay of remittances sent by internal migrants within Senegal. Their paper provides an interesting empirical analysis by testing the remittance decay hypothesis and finds significant results that contribute to the literature. This paper is followed by Lorinc Mucsi's analytical essay, in which he provides support for the alternative method of "evaluative voting" and empirically demonstrates how adopting such a system in Canada could result in interesting advantages over the current electoral system. The third paper in this edition is another excellent example of the work completed in the 4400E Thesis Course: Shane Bahmann and Matthew Campo's contribution evaluates the potential presence of the Dutch Disease phenomenon in Canada's economy through a rigorous empirical analysis. Finally, we conclude this year's edition with James Balsillie's paper, which provides an interesting analysis of how Conditional Cash Transfer Programs have had an observable impact on entrepreneurship in Brazil and Mexico, and the implications of this finding for future policy development.

We hope you enjoy reading the 2015 edition of the *Western Undergraduate Economics Review*. We would like to once again congratulate each of the authors for their excellent contributions, which we believe are truly representative of the dedication and talent of undergraduates in the Department of Economics at Western University. We hope that this publication continues to inspire and motivate future students in their academic pursuits.

Victoria Turner
Mitchell Nicholson
London, Ontario
April 2015

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Examining Remittance Decay for Internal Migrants in Senegal

Lorayne Mercado and Saad Usmani

Abstract

The objective of this paper is to compare the patterns of international and internal migrant remitters over time. Remittances are important to study and there is evidence to suggest that they are a powerful tool in poverty mitigation. However, there is increasing concern regarding the sustainability of living standards for households highly dependent on remittances due to the remittance decay hypothesis. This paper uses data from the World Bank to examine this relationship for households in Senegal in 2009. We also test the impact of other demand, supply, and motivational factors that affect remittance behaviour. The results do not support the remittance decay hypothesis for international migrants but do provide significant evidence for remittance decay over time for internal migrants. Examination of the effect of remittance determinants reflects new findings as well as results both congruent and contradictory to those found in previous literature.

Introduction

The nature of migration and remittances are receiving increasing attention due to evidence illustrating its impact at mitigating poverty. Previous literature focuses primarily on international migrants, yet internal migration (individuals who emigrate within the country) and its impact on remittances, specifically in Senegal, is important to understand due to the country's rural and urban regional imbalances. Many rural areas in Senegal consist of unsustainable economic and environmental conditions that impact a household's ability to maintain the basic living necessities, thus heavily relying on remittances for support. For example, rural regions face large food shortages primarily attributed to climatic reasons such as inadequate rainfall or contaminated water.

Seeing that rural households heavily rely on remittances to sustain their everyday expenditures in areas such as food, health, education, and housing, it is important to study the sustainability of remittances over time. In African regions, remittances exceed official development assistance and foreign aid, and thus remittance patterns are inextricably linked to living standards within these regions. This speaks volumes of the implications of varying remittance patterns on living standards for remittance-receiving households. If remittance levels decrease over time, so will the living standards of these households, which is a concern for public policy.

This paper looks to examine changes and trends of internal migrant remittances to their origin households, relative to individuals who emigrated internationally, over time. We hypothesize that over time, relative to international migrants, there is decay in remittances from internal migrants. The intuition behind this is that both types of migrants relocate to seek better economic and job opportunities. Once they have relocated, their total income is sufficient enough to support themselves as well as send

money back home. Over time, international migrants, such as those who emigrate to Canada and the United States, receive better opportunities and higher income potentials compared to their internal counterparts and are able to send more money to their country of origin. On the other hand, we predict that because internal migrants have lower income potential, relative to international migrants, they plateau at a faster rate. Once they hit this plateau, their level of remittances decreases due to their need to sustain increasing costs such as rent, health care, and everyday consumption.

Furthermore, an alternative explanation for internal migrant remittance decay is that at some point in time, both types of migrants will choose to settle down and start a family. After this occurs, we predict an observable decrease in the absolute value of remittances sent home by the internal migrant. We postulate that international migrants would have better access to a higher amount of social services, including health care and education, compared to migrants in Africa. The lowered access to social and government assistance for internal migrants results in these individuals contributing a larger proportion of their income towards rearing dependents. To test for total amount of remittances sent to origin household through time, we use Tobit regression analysis using household survey data collected by the World Bank in 2009. To evaluate the motivation behind our hypothesis, we will look at the relationship of total remittances sent, whether the migrant is living alone and level of income. Furthermore, we look at other variables that might be a large determinant of total remittances sent home.

Although evidence illustrates the large impact of remittances on economic development, research on the topic is still fairly undeveloped. The main motivation of this paper is to add meaningful contributions to a topic that is significant but somewhat new to investigation. In addition, all previous literature regarding remittances over time focuses solely on international migrants. Taking things one step further, we aim to directly compare internal and international remittances and their trends through time.

The structure of the paper is as follows: first, we explain remittances, specifically focusing on their importance in Senegal and other parts of Africa. Next, we discuss related literature and how we plan to build further on previous research. We then delve into our data, methodology, and results. Finally, we explain our conclusion and limitations of our analysis.

Understanding Remittances

Remittances reflect household income from individuals who have moved, geographically, within or across national borders. Remitters are categorized as household members and non-household members. Household remitters are individuals who used to live in the household that they are remitting to; non-household remitters are individuals, such as a friend of the remittance-receiving household, who lived in a household different from the one they are remitting to. Remittances take the form of cash and noncash items that flow through formal channels, such as electronic wire transfers, or informal channels, like money or goods carried across borders. In 2013, recorded remittance flows across international borders into developing economies exceeded US $410 Billion (World Bank

2013). Furthermore, evidence illustrates that such flows are underreported and that remittances through informal channels could add at least 50 percent to the globally recorded flows (World Bank 2006).[1] Although volume growth can be partially attributed to better reporting, the World Bank states that remittance flows have exceeded private capital flows and other foreign assistance.

For centuries people have migrated across borders seeking better opportunities. According to the International Fund for Agricultural Development (2009), African migrants annually remit about US $40 billion across international borders back to their families and origin communities. For African regions, the total value of remittances sent across international borders exceeds official development assistance and foreign direct investment. In 2012, remittances became the largest source of foreign funding to Africa and represented 11 percent of recorded global remittances (African Economic Outlook 2013). Freund and Spatafora (2005) conclude that approximately 75 percent of total remittances sent across international borders to Africa are unrecorded. Remittances act as a stable support for African families, especially during a time when investment and aid flows are experiencing heavy market pressures.

Remittances in Senegal

Households in Senegal are highly dependent on both international and internal remittances to sustain their standard of living. Senegal is one of the top receivers of remittances in sub-Saharan Africa and is an important and increasing source of foreign financing for the country. According to the Development Research Centre on Migration (DRCM), there were approximately 480,000 Senegalese individuals who migrated to other countries in 2007. This represents about 4 percent of the country's total population. The World Bank (2010, 2011) estimates that international and internal remittances sent through formal channels tripled from 2001 to 2010. This is illustrated in Figures 1 and 2.

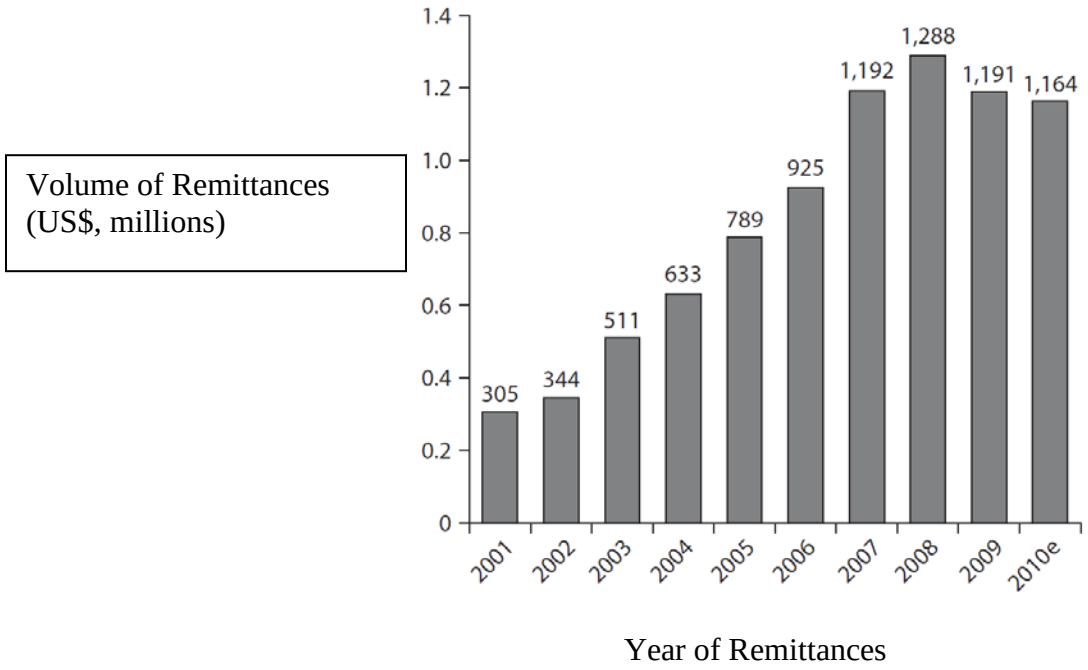
The true value of migrant remittances is difficult to calculate because a significant proportion is carried through informal channels, which is important for our research. Remitters likely use informal channels to decrease costs and avoid complexities. A 2007 survey conducted by the African Development Bank, collected information on both formal and informal remittance transfers. The survey provided the estimate that in 2005, inflows to Senegal totalled to CFA Francs 823 billion (19 percent of GDP).

Dynamics of the Remittances Transfer Marketplace in Senegal

The global remittances industry involves many money transfer intermediaries, known as remittance service providers (RSPs). RSPs consist of large and small businesses that can be licensed and unlicensed. The marketplace of RSPs is molded by various factors including the number of businesses actively involved, competition, government regulations and policies, the number of remittance services provided, and the demand for remittance services. RSPs fall under nonbank financial intermediaries (NBFI) (i.e. Western Union, Ria, and Moneygram), banks and credit unions, post offices, and

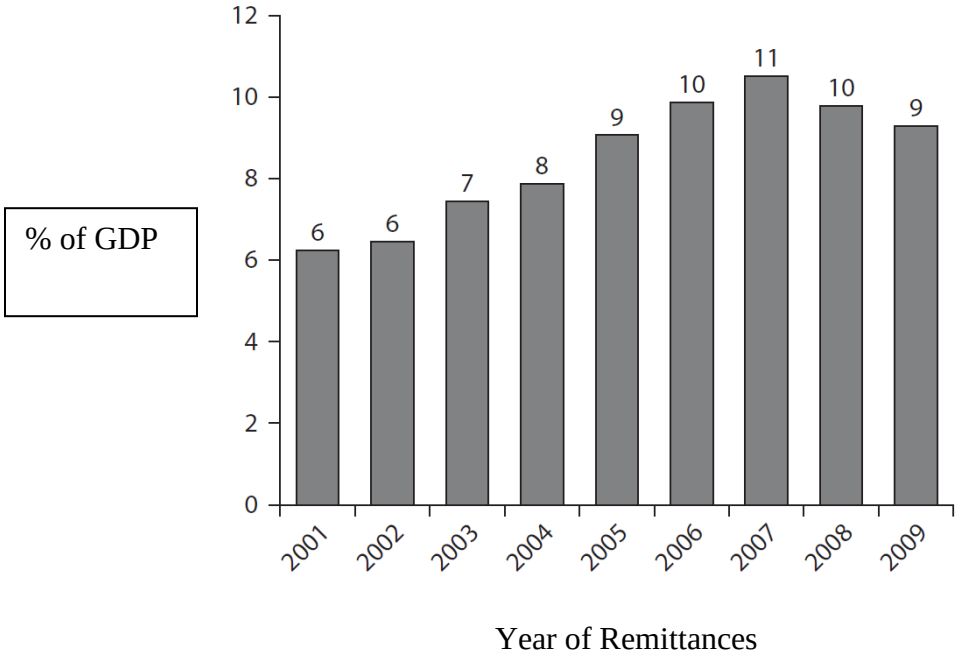
[1] The reporting of "small" remittances is not mandatory in most countries.

Figure 1: Volume of Migrant Workers' Remittances Sent to Senegal 2001-2010



Source: World Bank, 2010, 2011.
Note: Figures do not include remittances sent through informal channels

Figure 2: Migrant Workers' Remittances as a Share of GDP 2001-2009



Source: World Bank, 2010, 2011.
Note: Figures do not include remittances sent through informal channels.

informal intermediaries. Before the remittance is delivered to the receiving household, a number of participants become involved with the transaction. These participants include the RSP (a contracted agent who sells remittance transfers), the agent on the distribution side, and the financial institution used by the money transfer company to send the money. Remitters have the option to use any type of RSP, however, due to Senegal's money transfer and anti-laundering regulations, banks are the most popular institution to use.

Economic Significance of Remittances in Senegal

Remittances are the principal source for external financing to households in Senegal. Remittances received by households are mainly used for daily consumer expenditures and are followed by the expenditure of health, education, and rent. According to the World Bank (2011), 58.51 percent of remittances received by households are spent on everyday consumption. Table 1 illustrates the allocation of remittances for expenditures, according to the World Bank (2011).

Evidence shows that remittances have helped reduce poverty in Senegal. The second Senegalese Household survey by République du Sénégal, Ministère de l'Economie et des Finances (2004), illustrates how remittance transfers increased household expenditure by nearly 60 percent and reduced nationwide poverty by 31 percent. This survey also demonstrated that international migrants remitted higher volumes back to their home country when compared with national migrants. Moreover, migrants to Europe, The United States, and Canada are more likely to send remittances than individuals that emigrate within Africa and to other parts of the world. 81 percent of Senegalese migrants in Europe and 79 percent of Canadian and American migrants remit money back home. In comparison, only 60 percent West African Economic and Monetary Union members (UEMOA) and 65 percent of migrants in other African countries send money (Organisation internationale pour les migrations 2009).

Internal Migration and Remittances

Senegal currently faces interregional imbalances as many villagers from rural areas look to moving to urban centres such as Dakar, Diourbel, and Thies for economic development and employment opportunities. Certain conditions in rural areas such as food shortages and climactic factors such as inadequate rainfall also help to explain rural to urban migratory patterns in Senegal. Remittances are not enough to aid families in rural areas, and thus many individuals see migration to city centres as a solution to unsustainable living in rural areas. Therefore, the lack of a sustainable living environment and little financial assistance from migrant family members has increased migration to urban areas.

Related Research

The nature of remittances has only garnered significant attention recently, with most of the research focused on international remitters. This paper will build on previous, related literature to compare the patterns of international and internal migrant remitters

Table 1: Breakdown of Remittance Transfers Use, 2008 (% share of all transfers)

Use of Remittances	Number of Households Reporting (%)
Daily Consumption	58.51
Health	9.43
Education	3.59
Rent	12.57
Clothes	2.49
Car	0.15
Business	1.29
Others	11.98
Total	100

Source: World Bank, 2011.

over time. Gupta, Pattillo and Smita (2009) define remittances as a stable, private transfer where an individual is motivated to remit due to their altruism. They conclude that remittances have a direct poverty-mitigating effect in sub-Saharan Africa and promote financial investment. A shortcoming of this paper is that other pieces of economic literature, such as Brown's (1997a) paper conclude that there are other determinants for an individual to remit. Furthermore, Adams, Alfredo, and John (2008) study remittances, consumption, and investment in Ghana and also conclude that both internal (from Ghana) and international remittances (from Africa and other countries) decrease the level, depth, and severity of poverty in receiving households. The size reduction of poverty, however, is greater in households receiving international remittances. International remittance-receiving households saw a poverty reduction of 88.1 percent, while households receiving internal remittances experienced a 69.4 percent reduction in poverty. Evidence from this paper strengthens our intuition that, over time, international migrants exceed internal migrants' remittance levels, as higher levels of poverty reduction can be explained by larger volumes of financial aid (in the form of remittance).

Previous studies analyzing the behaviour of a remitter focus on the "remittance decay" hypothesis and their motives for remitting. The "remittance decay" hypothesis suggests that the amount of remittance sent by an individual declines as a migrant's length of absence increases and their ties to their origin country weaken. A study done by Brown (1997b) on the sustainability and determinants of remittances by Pacific Island migrants in Australia, conclude that time itself does not have a significant effect on migrants' remittance behaviour. Brown found that the percentage of migrants who remit decrease over time; however, the absolute remittance levels per remitter increase. Another study, by Simati and Gibson (1998) on migrants in New Zealand also found no evidence supporting the remittance decay hypothesis.

Some literature provides potential explanations of why remittances do not decay. Poirine (1997) suggests an idea of remittances as an implicit and informal loan agreement between family members and migrants (loan hypothesis). He hypothesizes that family members financially assist the individual to emigrate and this "loan" is paid back by the working migrant through remittances. In addition, Brown and Poirine (2005) theorize that remittances do not decline, due to a human-capital investment hypothesis. They argue that investment in the migrant's human capital is financed, as a loan would be, by the parents and later repaid by the working migrant through remittance. Once the loan is repaid, the migrant may become the source of financing for educational investment of the next generation of nonmigrants, implying that remittance decay would not occur. We will test these hypotheses to the case of Senegal by analyzing the effect of financial aid for emigration. We then will compare our findings as there is no additional research supporting these theories.

Brown's (1997b) paper will be the foundation of our research. The motivation of the study was the concern of sustainability of remittances and that economies dependent on remittances will experience declining living standards as migrant rates drop and if remittances decrease over time. Brown (1997b) uses survey data on Tongan and Western Samoan migrants in Sydney, Australia, and estimates remittance functions using Tobit regression analysis. He tests various determinants of remittances to analyze the validity of the remittance decay hypothesis and suggests that migrants are motivated by factors other than altruistic family support. Brown (1997b) uses a Tobit regression because the regression (remittances) in the sample include both remitters and nonremitters. Similarly, our dependent variable also includes both discrete (no remittances) and continuous (positive remittances) parts. Thus, we will also be using Tobit regression analysis to avoid the censored regression problem. Brown (1997b) explains that using the Tobit method yields consistent parameter estimates and each regressor has the same effect on the probability of whether or not a migrant remits and his remittance level.

Brown (1997b) categorizes motivations and determinants of remittances and classifies them as follows: demand-side pressures on a migrant from the receiving end (i.e. family ties); supply-side factors that affect a person's ability to remit (i.e. income); motivational characteristics that influence a migrant's decision to remit (i.e. altruism and self interest); and the duration of absence. We will be using these classifications to organize our chosen

variables for our analysis. These variables will be further discussed in the next section of the paper.

Data

The data set used in our analysis is the *Migration and Remittances Household Survey 2009*, which was collected by the World Bank in Senegal, Africa. The collection of these data spanned the time period October 2009 to November 2009. The dataset includes national representative information on three types of households: households without migrants, households with internal migrants, and households with international migrants.

The sampling procedure included two steps and distributed surveys to 2100 households. The first step was the selection of 100 districts with six sub strata–Dakar city high migration, Dakar city low migration, rural areas high migration, and rural areas low migration. Next, 21 households were selected in each sub sector—7 households without a migrant, 7 households with an internal migrant, and 7 households with an international migrant. Through this process, both household and individual level data were collected. For our analysis, we utilize the data file containing section 5 of the survey, *Internal and International Migration and Remittances from Former Household Members*, which excludes all observations from households without a migrant. This is because the aim of our analysis is to test the remittance decay hypothesis between internal and international migrants. Responses were structured according to unique household and person ID numbers. After removing observations that were missing variables necessary for our analysis, we were left with 1,266 total observations. A comprehensive list of the variables used is included in Table 2.

We use these data to analyze the determinants of the amount of remittances received by the household in the past year. Our dependent variable is the total amount (calculated in West African CFA Francs) of remittances sent by a migrant to their origin household within the past 12 months. Our first key independent variable used is the time (in years) a migrant has been living in their current location. In Brown's (1997a) study, he uses the length of absence since the individual's first migration to test for remittance decay. Unfortunately, our dataset does not include this information so we use *time spent in current location* as a proxy. We are limited in knowing the true length of time a migrant has been absent from their origin country because information about how many times a migrant has relocated, prior to their current residence, is unknown. To allow for non-linear decay, we also include a time-squared variable.

Our main objective is to analyze if remittance decay over time differs between internal migrants and international migrants. We therefore include a dummy variable to identify internal migrants. To specifically test for difference in time decay, we include interaction variables for internal migrants with both time and time squared. An important note for analysis is that during the time period June 2009 to September 2009, torrential seasonal rains in Senegal caused severe flooding in certain regions of the country (UN Office for

Table 2: Variables Used

Variable	Type	Definition
Dependent Variable:		
Remittances	Continuous	Total amount of remittances sent by migrant (internal/international) to HH in past 12months calculated in West African CFA francs
Independent Variables:		
Time	Continuous	Duration migrant has been living in current location calculated in years
Time_squared	Continuous	Time ^ 2
Internal_Migrant	Dummy	Equals 1 if Migrant migrated within Senegal; equals zero if international
Time*Internal	Continuous*Dummy (Interaction)	Time variable multiplied by the Internal Migrant variable
Time_sq*Internal	Continuous*Dummy (interaction)	Time squared variable multiplied by the Internal Migrant variable
Flood	Dummy	Equals 1 if the household in Senegal was in a region which experienced a flood during the year the survey was conducted
Internal*Flood	Dummy*Dummy (Interaction)	Internal Migrant variable multiplied by the Flood variable
Gender	Dummy	Equals 1 if Migrant is a female
Alone	Dummy	Equals 1 if Migrant lives alone in his current location
Employed	Dummy	Equals 1 if Migrant has full-time or part-time employment (including self employment); equals 0 if Migrant is a student, unemployed, retired, a housewife, sick or disabled, in military service or indicated a different status.
Migrant_a_spouse	Dummy	Equals 1 if Migrant is a spouse of the head of the household in Senegal
Migrant_a_child	Dummy	Equals 1 if Migrant is a child of the head of the household in Senegal
Fundedbymigrant	Dummy	Equals 1 if Migrant's first travel/migration was funded (even partially) by the migrant; equals 0 if he/she didn't fund their first travel/migration
Fundedbyparent	Dummy	Equals 1 if Migrant's first travel/migration was funded (even partially) by a parent; equals 0 if Migrant's parent(s) didn't do so
Support	Dummy	Equals 1 if Migrant received support from family/friends while residing in first migration location
Secondary	Dummy	Equals 1 if Migrant's highest schooling level completed before migration was either General Secondary Schooling or Technical/Vocational Secondary Schooling
Higherlevel	Dummy	Equals 1 if Migrant's highest schooling level completed before migration was Higher/University Level Schooling, Top-level Technical/Vocational Schooling, or Doctorate Level Schooling.

the Coordination of Humanitarian Affairs 2009).[2] Senegal typically experiences annual flooding, however, the severity and damages incurred in Senegal from the flood was of greater magnitude compared to previous trends. Over 600,000 people across West Africa were greatly affected, with Senegal being one of the hardest hit (United Nations 2009). Given that our data were collected from October to November 2009, we have to control for the impact of the flood on inflows of household remittances to Senegal. We add an additional control to test for the effect of the flood on internal migrants by using an interaction variable for internal migrants whose origin households are located in a flood-affected region. The reason we do this is because we assume that the flood may have also affected some internal migrants, thus influencing the total amount that they remit.

We also test Poirine's human capital hypothesis in the case of Senegal. In order to do this, we use dummy variables for an individual whose migration was self-funded (*fundedbymigrant*) or funded by a parent (*fundedbyparent*). To build on the notion of repaying some sort of social debt, we add a dummy variable for migrants who received any type of support from friends or family other than their parent (*support*). If the coefficient corresponding to the variable *fundedbyparent* is significant and positive, this implies that Poirine's theory holds. We incorporate the idea of supply and demand-side variables from Brown's (1997b) paper to help better explain remitting behaviours. For supply-side variables, we use the migrant's employment status and whether or not they live alone. Employment affects the degree to which a person is able to remit and having dependents living with the migrant in the host country decreases their propensity to remit. Demand-side factors that might impact remittances over time include a migrant's family ties to their household in Senegal, such as a spouse or parent. Moreover, we include a gender dummy variable as we hypothesize that being a female could negatively affect the amount of remittances sent. Finally, despite the lack of an income variable, we use *secondary* and *higherlevel* variables (indicating education level) as proxies. *Secondary* indicates whether or not the migrant's highest schooling level before migrating was secondary schooling (including general secondary schooling, as well as secondary technical/vocational schooling). *Higherlevel* signifies whether the migrant's highest schooling level, prior to emigrating, was a type of higher-level schooling such as university level education. Our intuition tells us that relative to other individuals, those with secondary level education will remit more back and those with higher-level schooling will remit even more. The summary statistics for these variables can be found in Table 3.

Methodology/Identification Strategy

Consistent with previous literature, we use the Tobit estimation model for our regression analysis. We use Tobit because of the large number of observations with values of zero for total remittances sent to household. The structural equation for the Tobit model is as follows:

$$y_i^* = X_i\beta + \epsilon_i$$

[2] Regions in sample unaffected by the flood: Diourbel, Louga, Tambacounda, Thies, Ziguinchor.

Here, the error term has a normal distribution with a mean at 0 and standard deviation of sigma-squared. The dependent variable is a latent variable that is censored for all values below zero but is defined and observed otherwise, thus the observed y is defined as (New York University n.d.):

$$y_i = \begin{cases} y^* & \text{if } y^* > \tau \\ \tau_y & \text{if } y^* \leq \tau \end{cases}$$

Our model is defined as:

$$\textit{Remittances}^* = \alpha + \beta_1 \text{Time}_i + B_2 \text{Time}_i^2 + B_3 \text{Flood}_i + B_4 \text{InternalMigrant}_i +$$

$$B_5 \text{Internal*Flood}_i + B_6 \text{Time*Internal}_i + B_7 \text{Time}^2\text{*Internal}_i + B_8 \text{Gender}_i + B_9 \text{Alone}_i +$$

$$B_{10} \text{Employed}_i + B_{11} \text{MigrantASpouse}_i + B_{12} \text{MigrantAChild}_i + B_{13} \text{FundedByMigrant}_i +$$

$$B_{14} \text{FundedByParent}_i + B_{15} \text{Support}_i + B_{16} \text{Secondary}_i + B_{17} \text{Higherlevel}_i$$

Where Remittances* is the latent variable in question and τ=0. The estimation of the Tobit model, in Stata, outputs coefficients that can be interpreted as the independent variables' (regressors) effect on the latent variable, Remittances*. Although estimates allow us to speak to the significance of the regressors, they only result in one unstandardized coefficient for independent variables, even though there are cases where the dependent variable is 0 and other cases where it is positive (Roncek 1992). Decomposing the Tobit results into estimates that compute the following coefficients for the various independent variables solves this problem:

1) The marginal effect on the probability that the dependent observation is positive;
2) The marginal effect on positive observations;
3) The marginal effect on the actual dependent variable (McDonald and Moffitt 1980) (Spermann 2009).

Results

The estimated results for the original Tobit coefficients, as well as the marginal results are found in Table 4. First we discuss the results for the main variables in question, specifically, the effects of time and placement of migration. Next, we detail the results of the demand, supply, and motivational control variables.

After controlling for multiple variables, our findings fail to support the remittance decay hypothesis in the case of international migrants with households in Senegal. This is in line with some of the previous literature, specifically, that of Brown (1997a). The coefficients for time, contrary to the decay hypothesis, illustrate a positive relationship between time spent in the migrants' current location and the marginal effects for the

Table 3: Summary Statistics

	Mean	Standard Deviation	Observations
Remittances	548889.8	783639.3	1266
Time	9.23	7.88	1266
Flood			756
Internal			515
International			751
Male			1085
Female			181
Alone			413
Not Alone			853
Employed			1084
Migrant a Spouse			170
Migrant a Child			652
Migration self-funded			804
Migration funded by parents			486
Support			902
Secondary level schooling			282
Higher level schooling			148

All Migrants

Time (years)	**Count**
[0-6)	505
[6-11)	418
[11-16)	124
[16-21)	113
[21-26)	44
[26-31)	31
[31-36)	14
[36-41)	12
[41-46)	1
[46-51)	2
[51-56)	0
[56-61)	2

International

Time (years)	**Count**
[0-6)	273
[6-11)	256
[11-16)	82
[16-21)	76
[21-26)	27
[26-31)	22
[31-36)	11
[36-41)	8
[41-46)	1
[46-51)	1
[51-56)	-
[56-61)	-

Internal

Time (years)	**Count**
[0-6)	232
[6-11)	162
[11-16)	42
[16-21)	37
[21-26)	17
[26-31)	9
[31-36)	3
[36-41)	4
[41-46)	0
[46-51)	1
[51-56)	0
[56-61)	2

Total	1266	757	509

probability of remitting and the amount remitted as a whole, but are insignificant at 0.10 level. The same is true for the non-linear time-squared relationship. We conclude that our model provides no evidence that remittances to households decrease over time for international migrants.

Our estimates show that the marginal effects on being an internal migrant are large negative values, and these coefficients are significant at the 0.05 level. An internal migrant is 26 percent less likely to remit compared to international migrants and, on average remits, 442,372 less West African CFA Francs. This observation is congruent with previous literature on remittances in other countries where international remittances are observed to reduce poverty at a much higher level than internal remittances. This could reflect higher earning potential abroad as opposed to opportunities within the country as other literature suggests. However, we are unable to prove this due to the absence of an income variable in the survey.

The model proves to be most interesting when analyzing the remittance decay effect for internal migrants relative to international migrants. By using an interaction variable between internal migrants and time, we find that, although the linear remittance decay effect is insignificant, a non-linear time-squared remittance decay effect appears to be significant at the 0.05 level. This supports our initial hypothesis that the remittance decay effect is present for internal migrants relative to international migrants. Figures 3 and 4 (created using averages from the raw data) display the relationship between remittances and time for both internal and international migrants and further support our findings. The average remittances from international migrants, while falling briefly for those in the 31-36 age group illustrates an overall positive trend over time. For the internal migrants however, the graph conveys a steep fall in remittances after the age of the migrant reaches 31.

While the mechanisms behind our intuition suggest that it is the difference in earning potential over time that could explain this variance, we are unable to justify this because of the lack of an income variable. Furthermore, our *alone* variable is insignificant at 0.10 level, thus our postulation that internal migrants have to contribute a greater share of their income towards raising their dependents prove to be inconclusive. We realize that the *alone* dummy variable does not specify if the individual is living with a dependent, in which case they would have to financially support them, or a non-dependent such as a roommate or friend. We conclude that our results reflect a relative decline for internal migrant remittances over time likely as a result of the difference in earning potential within Senegal versus other countries individuals migrate to.

The flood coefficients, while significant at the 0.05 level, had results contrary to our intuition. We postulated that the regions severely affected by the flood would receive a higher volume of remittances, but actually received considerably less from international

Table 4: Marginal Effects After Tobit

	Tobit Coefficients (P-Value)	Marginal effect for P(y>0|x) (P-Value)	Marginal effect for E(y|x,y>0) (P-Value)	Marginal effect for E(y|x) (P-Value)
Time	12744.08	0.0053987	7024.039	9786.471
	(0.201)	(0.201)	(0.201)	(0.201)
Time_squared	184.60	0.0000782	101.7427	141.7563
	(0.536)	(0.536)	(0.536)	(0.536)
Flood	-284367.5	-0.11645	-160235.1	-221503.2
	(0.000)**	(0.000)**	(0.000)**	(0.000)**
Internal_Migrant	-600279.5	-0.264297	-318330.6	-442372.2
	(0.000)**	(0.000)**	(0.000)**	(0.000)**
Internal*Flood	273695.4	0.1063601	159457.6	218411.8
	(0.001)**	(0.001)**	(0.003)**	(0.002)**
Time*Internal	15744.08	0.0066696	8677.524	12090.24
	(0.29)	(0.29)	(0.29)	(0.29)
Time_sq*Internal	-1001.73	-0.0004244	-552.1145	-769.2514
	(0.025)**	(0.025)**	(0.024)**	(0.024)**
Gender	-128559	-0.0569717	-68459.5	-96056.2
	(0.061)*	(0.073)*	(0.053)*	(0.054)*
Alone	-47382.57	-0.0202369	-25961.28	-36219.49
	(0.312)	(0.316)	(0.309)	(0.310)
Employed	200205.4	0.0907505	104561.8	147134.9
	(0.002)**	(0.004)**	(0.001)**	(0.001)**
Migrant_a_spouse	571398.4	0.1880867	363211	480001.7
	(0.000)**	(0.000)**	(0.000)**	(0.000)**
Migrant_a_child	52840.81	0.0224088	29099.89	40548.97
	(0.258)	(0.258)	(0.257)	(0.257)
Fundedbymigrant	120547.1	0.0519285	65616.52	91647.51
	(0.065)*	(0.069)*	(0.062)*	(0.062)*
Fundedbyparent	184983.9	0.0766274	103501.8	143528.8
	(0.003)**	(0.002)**	(0.003)**	(0.003)**
Support	-18493.65	-0.0078015	-10223.39	-14233.71
	(0.701)	(0.700)	(0.702)	(0.702)
Secondary	96214.16	0.0396419	54050.89	74929.61
	(0.071)*	(0.063)*	(0.076)*	(0.074)*
Higherlevel	197091.4	0.0768588	114626.1	157240.2
	(0.004)**	(0.002)**	(0.006)**	(0.005)**
	Pseudo R^2= 0.0079			
	N= 1249	**= significance level at the 0.05 level		*= significance level at the 0.10 level

Figure 3: International Migrants Average Remittance

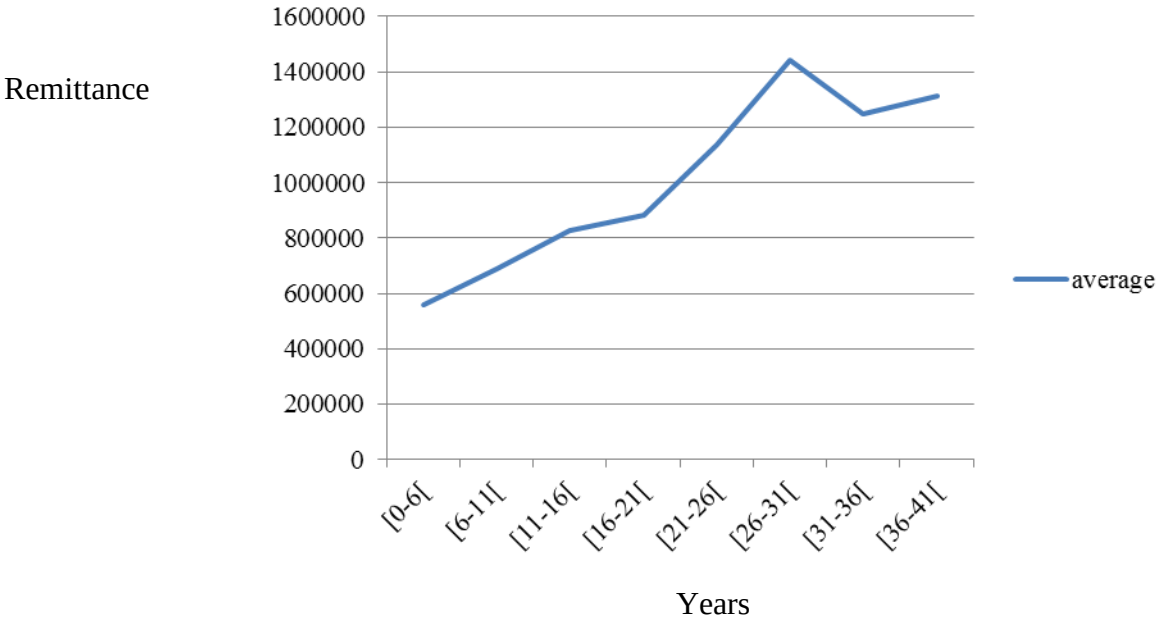
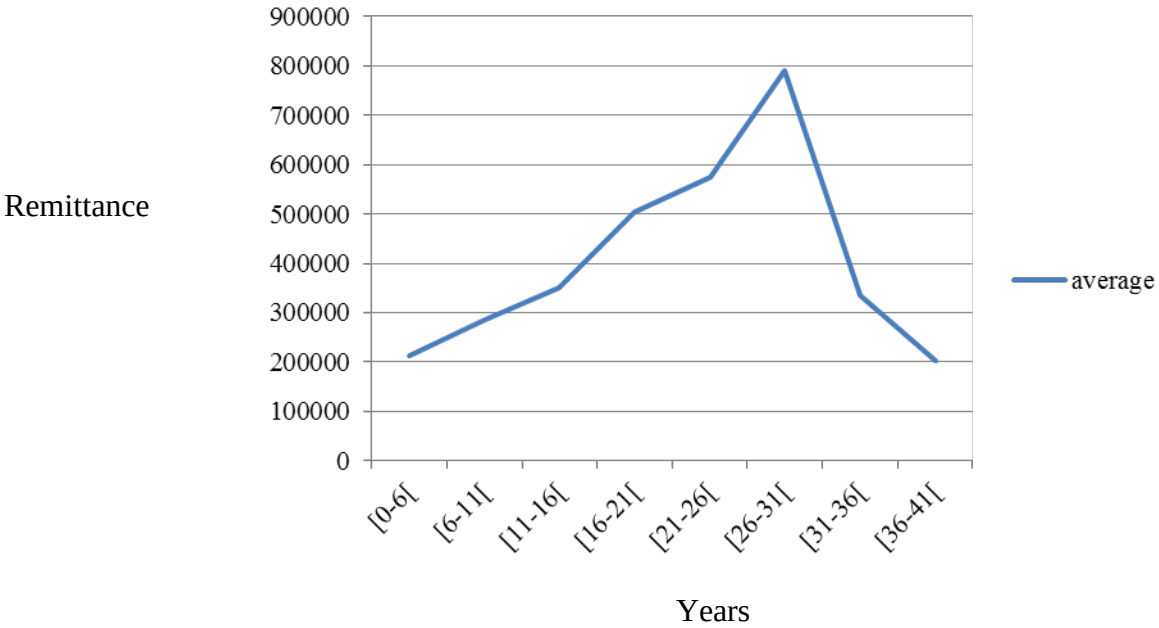


Figure 4: Internal Migrants Average Remittance



migrants compared to the amount sent to unaffected regions. An implication to why the affected regions received less remittances is that these areas might be wealthier and thus do not need as much financial support, in the form of remittances, in the event of a natural disaster. For example, Dakar city was greatly affected, however, as Senegal's capital, it may have had enough resources to repair damages without any help from international remitters. Furthermore, the affected regions may be areas that are most susceptible to flooding, regardless of the severity of the flood, thus already have disaster plans, support, and insurance already set in place and would not need as much additional help from remitters.

We also predicted that internal migrants would remit less than their international counterparts to these regions because of the possibility that the flood also affected them. Our results show that internal migrants remitted more compared to international migrants and were significant at the 0.05 level. This result suggests that internal migrants remit more during a natural disaster compared to their international counterparts. A possible explanation for this result is that internal migrants are more closely impacted by the disaster and thus are more willing to help their families. Ultimately, the results regarding the flood have left us with unanswered questions. We know that the regions of Dakar, Fatick, Kaolack, Kolda, Matam, and St-Louis were affected by the flood according to Red Cross reports (International Federation of Red Cross 2009), but due to the lack of granular data available in these regions, we are unable to test variables that are unique to the affected areas (or unaffected areas) that would produce this result.

We predicted that the *gender* variable would be significant and in our model we arrived at a result significant at the 0.10 level that illustrated that females have a lower probability to remit and on average remit less.

The demand, supply, and motivational regressors included in our model achieved mixed results. The employed regressor displayed coefficients that were statistically significant at the 0.05 level. According to the model, those with part-time or full-time jobs were roughly 9 percent more likely to remit and, over the whole sample, on average remitted 147,135 more West African CFA Francs than those with a differing employment status. Contrary to results from Brown's (1997b) paper, our estimates display inconclusive evidence that, on the margin, those with a parent in their origin country remit more. This could be as a result of the variable only considering the household head, as opposed to the existence of a parent back home in general. However, our model does provide statistically significant evidence that a migrant with a spouse back home remits more. These individuals on average are 19 percent more likely to remit and, in general, remit 480,002 Francs more than those individuals without this relationship. Further building on the results in Brown's (1997b) paper, we find that our analysis also provides evidence for indebtedness to the home community. Those migrants whose first migrations were funded by their parents, in Senegal, were on average 7.7 percent more likely to remit and remitted 143,529 Francs more. These coefficients are shown to be statistically significant at the 0.05 level in our model.

In addition, our initial intuition that those who self-funded their migration were likely to remit less proved to be incorrect according to our results, which were significant at the 0.10 level. Instead these migrants were 5.2 percent more likely to remit than other migrants and on average remitted 91,648 more. This could be because migrants who self-funded their migrations represent more responsible individuals who not only are relatively better at attending to their own needs but the needs of their family as well. Support provided by friends or family in first migration location proved to have insignificant meaning in our model.

Finally, the education variables used came out to be statistically significant in our results. Those with secondary level schooling on average remitted 74,930 more while those with higher-level schooling remitted 157,240 more. This closely aligns with our initial hypothesis.

Conclusion

In this paper our aim was to build on previous economic literature on remittances and specifically examine if the remittance decay hypothesis differs between internal and international migrants in Senegal. Our findings confirmed previous work done by Brown (1997a) as we failed to find statistically significant results that supported the remittance decay hypothesis. We did, however, find there to be a statistically significant non-linear remittance decay effect for internal migrants relative to international migrants. This may be explained by the difference in income earning potential between individuals within Senegal and those residing and working in countries outside of Senegal. We also found that internal migrants, on average, remit less than international migrants, likely for the same, aforementioned reasons. By testing the effect of the flood affected regions, that year, we arrived at the surprising results that flooded regions received less remittances from international migrants than unaffected regions and that internal migrants remitted more to these regions than their international counterparts. The lack of granular data available on the specific regions over time makes it difficult to fully understand the mechanisms behind these results. We believe that the first result could be explained by differences in wealth between the two groups of regions. The second conclusion is possibly the result of a closer social bond between the affected families and the internal migrants. Moreover, we saw that females, on average, remit lower amounts than men.

The demand, supply, and motivational regressors analysis adopted from previous research also proved to be useful in explaining remittance behaviour in Senegal. Full-time/part-time employment, for one, reflected a tendency to remit more. In contrast to Brown's (1997b) findings, we could not conclude that migrants with a parent back in Senegal remitted more, but it was the case that migrants with a spouse in Senegal did. Our results did, however, mirror Brown's when examining migrant indebtedness to the home community, as migrants whose parents funded their initial migration gave more back through remittances. The same applied to migrants who funded their own migration in any capacity. Given the lack of income data, education can potentially be seen as an avenue of building earning potential and our findings suggest that higher-level education is associated with larger amounts of remittances being sent back home.

Considerations

While our findings are intriguing and relatively new within the field of remittances, the lack of data raises further questions. We believe the most important variable currently missing for our analysis is income, which could provide great explanatory power to our regression. The surprising results from our flooded regions testing also led us to believe that granular data on the regional level would greatly benefit remittance analyses. Details about the differences in wealth, as well as differences in aid provided to these regions, could provide greater insight into the results. The final vital missing piece of information is the number of dependents for the migrant. While we tried to use the alone variable to control for this, we did not know the specifics behind this variable, only if the migrant lived alone or with another person. These limitations represent reasonable concerns towards the conclusiveness of our results.

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A Discussion of the Merits of Evaluative Voting

Lorinc Mucsi

Introduction

This paper argues that there is not only theoretical support that evaluative voting (EV) is superior to other voting methods but also that there is empirical evidence on certain aspects of EV that, while not conclusive, offer valid support for its implementation. First, the theoretical advantages of EV when compared to the alternatives of plurality voting (PV) and instant runoff voting (IRV) are presented. Next, four setbacks to EV are raised that must be overcome in order to argue that EV is superior to both PV and IRV. Two papers are then examined which provide varying degrees of support for overcoming three of these aforementioned setbacks. An empirical investigation demonstrates how EV, if implemented, would have changed the outcome of the 2011 Canadian Federal Election. Finally, the paper argues that the election results under EV would have been more favourable in terms of accurately reflecting voters' preferences.

What is Evaluative Voting?

Evaluative voting is a voting system under which voters assign values to candidates based on the utility that would be provided by those candidates if they were elected. EV uses a uniform, standardized scale to allow voters to express their cardinal utility: voters rate each candidate according to their preferences. Claude Hillinger proposes an EV-3 scale for general elections. EV-3 means that voters can rate candidates on a three-point scale: -1 for disapproval, 0 for indifference, and 1 for approval. In an election, the points from each voter are aggregated, and the candidate with the largest sum is elected. Hillinger restricts the scale to three values for the reason that there is a limit on human capabilities to preferentially differentiate among many alternatives (2004, 7). For the purposes of this paper, EV-3 will be referred to simply as EV.

This paper assumes that there are at least three candidates in any election. Since the scope of this paper is the Canadian federal government, two-party elections are not discussed.

Evaluative and Plurality Voting

Under plurality voting (PV), a voter is given a ballot with two or more candidates, and he must choose a single candidate whom he would like to elect into the government. A defect of PV is that the presence of a third party candidate can influence the election in such a way that the winning candidate is strongly disliked by the majority. Consider the following table.

Table 1: Plurality Voting Defect

Number of Voters	Preferences
3	A>B>C
2	C>B>A
2	B>C>A

In Table 1, Candidate A wins the election under PV with three votes, and yet the other four voters prefer both B and C over A. Therefore, the candidate that makes the majority worst off is elected. Arguably, this flaw occurred in the 2011 Canadian federal election, but that is discussed later in this paper. Suppose EV was used in the above election. Assuming that a voter with preferences A>B>C would rate A with a value of 1 (approval), B with 0 (indifference), and C with -1 (disapproval), B wins the election receiving a net value of 2. Candidates A and C each receive a net value of -1. B is not strongly disliked by the majority; in fact, B is the second choice of two preference sets and the top choice of one. Therefore, the election of B appears to be a more widely preferred and representative outcome.

Hillinger claims that voter turnout would likely increase if EV was implemented (2004, 16-17). Since the probability of a single voter affecting the outcome of an election is extremely small, and yet people still vote, there must be, at least in part, an element of expressive voting. If people do vote expressively, then a voting system that allows individuals to express both their negative and positive feelings is desirable. Many voters have more negative feelings towards politicians, so under PV, these voters may choose to abstain from voting altogether (Hillinger 2004, 16). Since EV gives voters a chance to express both negative and positive feelings, such a system would likely increase voter turnout.

Hillinger also argues that EV reduces the incentive for strategic voting. A voter votes strategically if, under PV, he "choose[s] the candidate he prefers among the two that are leading in the polls" (Hillinger 2004, 15). Under EV, "a voter has no strategic incentive to withdraw his vote from the candidate he likes best" (Hillinger 2004, 15). A voter with preferences A>B>C has no strategic incentive to vote insincerely in regard to A or C. He awards the maximum number of points to A and the minimum to C. Only the B rating may be strategically motivated. If he feels as though A has no chance of winning, he may award B the maximum points as well. The point is that even if the voter feels as though A has no chance of winning, he has no incentive to take points away from A. Under PV, the voter may choose to give up his first preference and vote for B to minimize the chances of C winning. In other words, PV provides incentives to vote insincerely. Even though EV allows for strategic behaviour, it does not encourage insincere voting with regard to first and last preferences. Therefore, strategic behaviour is less obtrusive under EV.

Evaluative And Instant Runoff Voting

Hillinger also compares EV to instant runoff voting (IRV). Under IRV, each voter submits a preferential ranking of candidates where a voter's most preferred candidate is

given one point. All the points are added up, and if no candidate wins a majority, then the candidate with the lowest sum of votes is eliminated and its votes are transferred to voters' second preferences. The process is repeated until a majority is obtained. However, Hillinger claims that IRV fails to eliminate numerous paradoxes such as the No-Show Paradox. Consider the following table.

Table 2: No-Show Paradox I

Number of Voters	**Preferences**
3 (*unsure whether to vote or abstain*)	*A>B>C*
3	A>B>C
5	B>C>A
7	C>A>B

The three voters with preferences A>B>C are unsure whether to vote or abstain. Table 3 represents the case in which they abstain and Table 4 in which they vote.

Table 3: No-Show Paradox II

Three Voters Abstain		
Number of Voters	**Preferences**	
3	A>B>C	
5	B>C>A	
7	C>A>B	
Votes	**Round 1**	**Round 2**
A	3 (eliminated)	N/A
B	5	**8**
C	7	7

Table 4: No-Show Paradox III

Three Voters Vote		
Number of Voters	**Preferences**	
6	A>B>C	
5	B>C>A	
7	C>A>B	
Votes	**Round 1**	**Round 2**
A	6	6
B	5 (eliminated)	N/A
C	7	**12**

B and C are the winners respectively. The paradox occurs because voters preferring A to both B and C influence whether B or C wins simply by voting or abstaining. This should not occur as it provides incentives for voters to make calculations on whether to vote or not, when ideally, everyone should vote.

Voters choose to vote or abstain under EV as well, but EV does not provide incentives to abstain. The paradox does not occur under EV. Suppose X wins but a voter, who prefers Z to both X and Y, did not vote. Had he voted, the outcome under EV could change from X to Z but not from X to Y. That is, the voter does not influence the outcome relative to his less-preferred candidates, regardless of whether he votes or not. Under PV, this is not the case. Therefore, Hillinger concludes that EV is superior to IRV.

Setbacks Of Hillinger's Argument

In his paper, Hillinger assumes that people behave evaluatively without offering evidence. Hillinger's claim that some preferences are stronger than others makes intuitive sense, but empirical evidence demonstrating that this is true would offer Hillinger and his

arguments support. Bart R. Salisbury conducted an experiment on evaluative behaviour, which provides strong support to Hillinger's paper and is discussed in the next section.

Hillinger also fails to provide evidence that the No-Show Paradox occurs frequently under IRV. If the probability of the paradox occurring is small, then this issue becomes insignificant. However, IRV also fails the More-Is-Less Paradox (monotonicity criterion), which is examined in the section following Salisbury's experiment. In fact, Joseph Ornstein and Robert Norman find that "three-way competitive races will exhibit unacceptably frequent monotonicity failures under IRV" (2014, 10). Therefore, there is good reason to reject IRV in favour of EV.

A third setback of Hillinger's paper is that it fails to provide evidence that EV actually increases turnout. Unfortunately, such data is not readily available because EV has not been implemented yet in researched general elections.

A final setback addressed in this paper is that Hillinger does not offer empirical research and evidence on whether strategic voting is in fact less severe under EV than under PV. The discussion provided in this paper on the 2011 Canadian federal election addresses this problem, and offers some empirical support to Hillinger's claim.

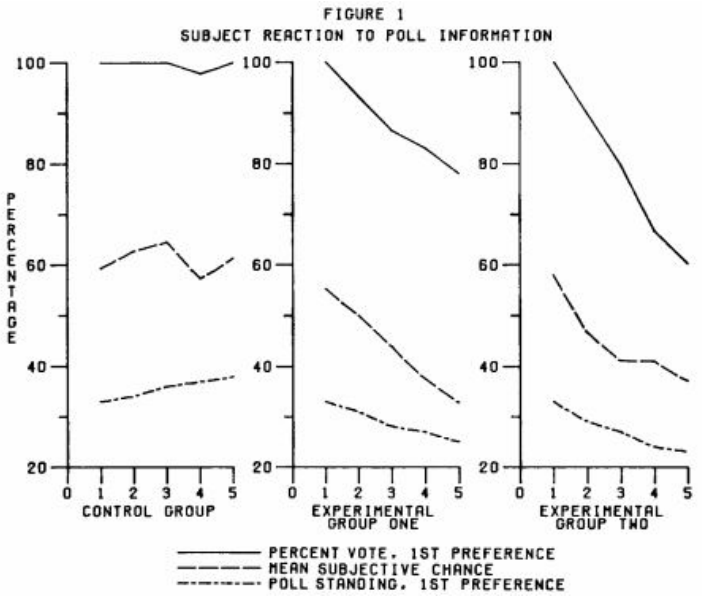
Salisbury On Evaluative Behaviour

The purpose of Bart R. Salisbury's paper is to examine how voters behave when faced with three candidates in an election. He uses a computer assisted election simulation to generate five separate polls during a hypothetical campaign leading up to election time. A sample of 183 students is selected for the experiment, and each student is given a handout describing three candidates' positions on five issues.

The students are then divided into a control group (CG) and into two experimental groups (EG-1 & EG-2), and each group is given different polling data. CG's polls indicate that the voters' first preference is in a close race with their second preference while the third is far behind. EG-1's polls indicate that their second preference is well ahead of the other two. EG-2's polls indicate that the second and third preferences are in a close race with each other while their first is far behind. Salisbury claims that if a voter "exercises evaluative behaviour, each context will result in a predictable outcome" (1983, 89). In CG, voters will choose their first preference. In EG-1, voters may abstain, vote for their first preference, or vote for their second preference. In EG-2, voters will choose their second preference.

After each poll, the students are asked which candidate they would vote for if the election were held at that moment. Given a scale of 0 to 100, students indicate the chances they feel their most preferred candidate has of winning as well as who they would vote for. The former is the mean subjective chance (MSC). The effect on voters' first preferences, as the five poll results become known, is presented in Salisbury's Figure 1, as shown below.

Figure 1: Subject Reaction to Poll Information



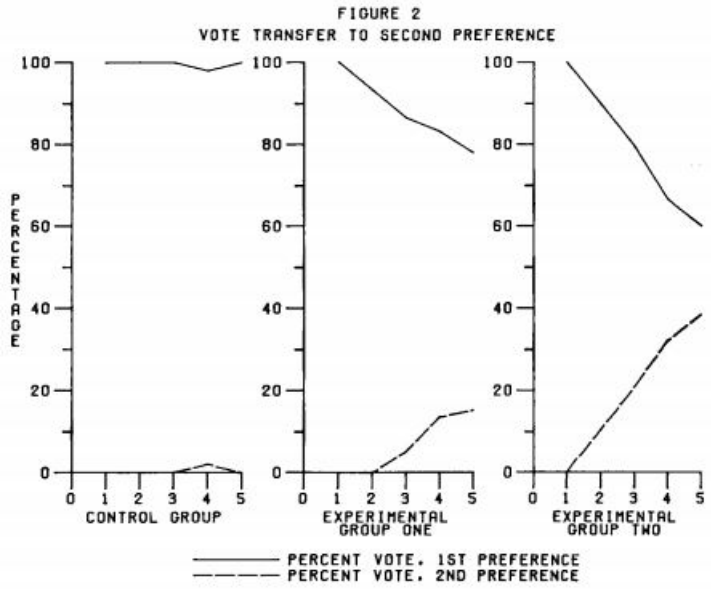
Source: (Salisbury 1983, 91)

In CG, nearly all the students selected their first preference. In poll 4, some students did not select their most preferred candidate, but this makes sense because there was a drop in MSC as well. In other words, voters thought the chances of their candidate winning had decreased. Also, the drop is minimal, so it does not reflect major changes in voters' behaviour. In EG-1, where voters' second preferences are well ahead of the other two, the number of students voting for their first preference decreases as the polls approach election time. Similar results are observed in EG-2, where the chances of voters' first preferences being elected are slim. But the effect on first preferences is not sufficient to show that evaluative behaviour exists. A decrease in voting for their first preference must coincide with an increase in their second preference. As shown in Figure 2 below, Salisbury finds that this is true.

In both EG-1 and EG-2, it is clear that as voting for first preferences decreases over time, voting for second preferences increases. From this figure, it is evident that vote transferring occurs.

Salisbury makes two observations from his experiment. The first is that the voters in EG-1 and EG-2 recognize time constraints (Salisbury 1983, 93). At first, voters are more sincere, as indicated by their intention to vote for their most preferred candidate. However, as the polls progress and approach election time, voters become strategic and transfer votes to their second preference as it becomes clearer that their first preference will lose. The second observation is that even if there is clear evidence that the preferred candidate will lose, some still continue supporting their preferred candidate. Salisbury has three explanations for this. First, if a voter's second and third preferences are very close

Figure 2: Vote Transfer to Second Preference



Source: (Salisbury 1983, 92)

to one another, then they will likely continue to support their most preferred candidate (Salisbury 1983, 94). Second, people process information differently; it is unlikely that a consensus will be reached on the time when the first preference becomes an obvious loser (Salisbury 1983, 94). Third, voting for an obvious loser can be interpreted as expressive voting (Salisbury 1983, 94), meaning that voters receive a consumption benefit from voting for their most preferred candidate.

Salisbury's experiment shows that individuals make strategic decisions when voting: voters often give up their most preferred choice in order to make a stronger impact on the election. Under EV, there is no need to take away from their most preferred candidate. An individual can approve or disapprove of each candidate independently from others. If people do in fact engage in evaluative behaviour as Salisbury claims, then a voting system that allows voters to accurately convert their preferences into their vote, such as EV, is desirable.

Ornstein And Norman On Monotonicity

In addition to IRV suffering from the No-Show Paradox (as shown before), IRV also has the defect of nonmonotonicity. The authors define monotonicity failure as a "situation in which the IRV winner would lose if ranked higher by some subset of voters" (Ornstein and Norman 2104, 2). In their paper, Ornstein and Norman calculate the frequency of the occurrence of this paradox, and conclude that instances of nonmonotonicity are more frequent in 3-candidate elections than widely presumed.

As a case study, the authors present the 2009 Burlington, Vermont mayoral election. The actual results of the election are presented in the table below where Republican,

Democrat, and Progressive are represented as R, D, and P, respectively:

Table 5: 2009 Burlington, Vermont Election I

	Number of Voters								
Ranking	1513	495	1289	1332	767	455	2043	371	568
1st	R	R	R	D	D	D	P	P	P
2nd	D	P		P	R		D	R	
3rd	P	D		R	P		R	D	

Source: (Ornstein and Norman 2014, 2)

Under IRV, a voter submits a preference ranking, but only their first preference is awarded a point. Therefore, in the first three columns in Table 5, in which the Republican candidate is ranked first, voters award a point to the Republican candidate in the first round of elections. Similarly, the next three columns represent the preference rankings in which the Democratic candidate is ranked first. In those columns, the Democratic candidate receives points. In the final three columns, the Progressive candidate receives points. The candidate with the least votes is eliminated, and the eliminated votes are transferred to voters' second preferences. If the votes in Table 5 are added up, the Democratic candidate receives the least number of votes, as shown in Table 6.

Table 6: 2009 Burlington, Vermont Election II

	Republican Votes	**Democrat Votes**	**Progressive Votes**
Round 1	3297	2554 (eliminated)	2982
Round 2	3297 + 767 = 4064	N/A	2982 + 1332 = 4314

The Progressive candidate wins with 4314 votes because even though the Republican candidate received more votes in the first round, more Democrat supporters prefer the Progressive over the Republican candidate than vice versa. Therefore, the Progressive candidate receives more votes in the second round and wins the election.

Monotonicity tells us that if a candidate receives more votes, he cannot be any worse off. Accordingly, if the Progressive candidate had received even more votes, he would still win. However, under IRV, this is not necessarily the case. Consider a hypothetical situation where 750 Republican supporters had actually voted for the Progressive candidate. Table 7 shows the results of the hypothetical election.

Adding up the results in Table 7, we find that the Republican candidate is eliminated as shown in Table 8.

Table 7: More-Is-Less Paradox I

	Number of Voters								
Ranking	1513	**195**	**839**	1332	767	455	2043	**1121**	568
1st	R	R	R	D	D	D	P	P	P
2nd	D	P		P	R		D	R	
3rd	P	D		R	P		R	D	

Source: (Ornstein and Norman 2014, 3)

Table 8: More-Is-Less Paradox II

	Republican Votes	**Democrat Votes**	**Progressive Votes**
Round 1	2547 (eliminated)	2554	3732
Round 2	N/A	2554 + 1513 = 4067	3732 + 195 = 3927

In this modified situation, the Democratic candidate wins the election. In other words, increasing the Progressive candidate's vote share makes him lose the election. Furthermore, as the authors claim, "it is telling that out of the only two IRV elections in Burlington, Vermont, there has already been one recorded instance of nonmonotonicity" (Ornstein and Norman 2014, 9).

The authors then develop a spatial model of voter behaviour in which they calculate the frequency of the occurrence of the paradox, and they conclude that they are more frequent in 3-candidate elections than widely presumed. In fact, in each of the 5000 simulated elections, the frequency of this phenomenon ranged from between 0.7 percent to 51 percent (Ornstein and Norman 2014, 6). However, in closely contested elections, the frequency ranged from 15 percent to 51 percent (Ornstein and Norman 2014, 6). In other words, as the election gets closer, the likelihood of a monotonicity failure occurring increases. Based on these results, the authors caution against the use of IRV in elections.

EV cannot fail the monotonicity criterion because this voting method is not based on ranking. Rather, candidates are considered independently from each other, and thus the value assigned to a candidate does not affect the value a voter can assign another candidate. Therefore, in the context of paradox failure, EV is superior to IRV.

Evaluative Voting In The 2011 Canadian Federal Election

Currently, the Conservative Party holds a majority government in Canada, as determined by the federal election in 2011. However, there are at least two theoretical flaws associated with this election outcome. First, only a minority of voters supports the Conservative party, with a popular vote of 39.62 percent. Second, there are massive gaps between the seat and popular vote percentages. Consider the results in Table 9 from Elections Canada.

Table 9: 2011 Canadian Federal Election Results

Party	Seat Vote Percentage	Popular Vote Percentage	Absolute Difference
Conservative	53.90	39.62	14.28
Liberal	11.04	18.91	7.87
NDP	33.44	30.63	2.81

The problem with such large differences between the two percentages is that the seat vote fails to accurately reflect citizens' preferences. Accordingly, a voting system that bridges the gap between the seat vote and the popular vote is desirable because it results in a more accurate aggregation of individuals' preferences.

A proportional representation system (PR) solves this problem, as parties acquire a proportion of seats in Parliament equivalent to their popular vote. However, PR has accountability issues: since citizens vote for a party rather than for a candidate, candidates are less loyal to the population than to their party (which places their name on the ballot). If a candidate wishes to be on the ballot, he must gain the favour of the party. In essence, PR trivializes the purpose of having ridings that represent a certain district's view. EV promotes the use of ridings and yet has similar outcomes to what PR would achieve.

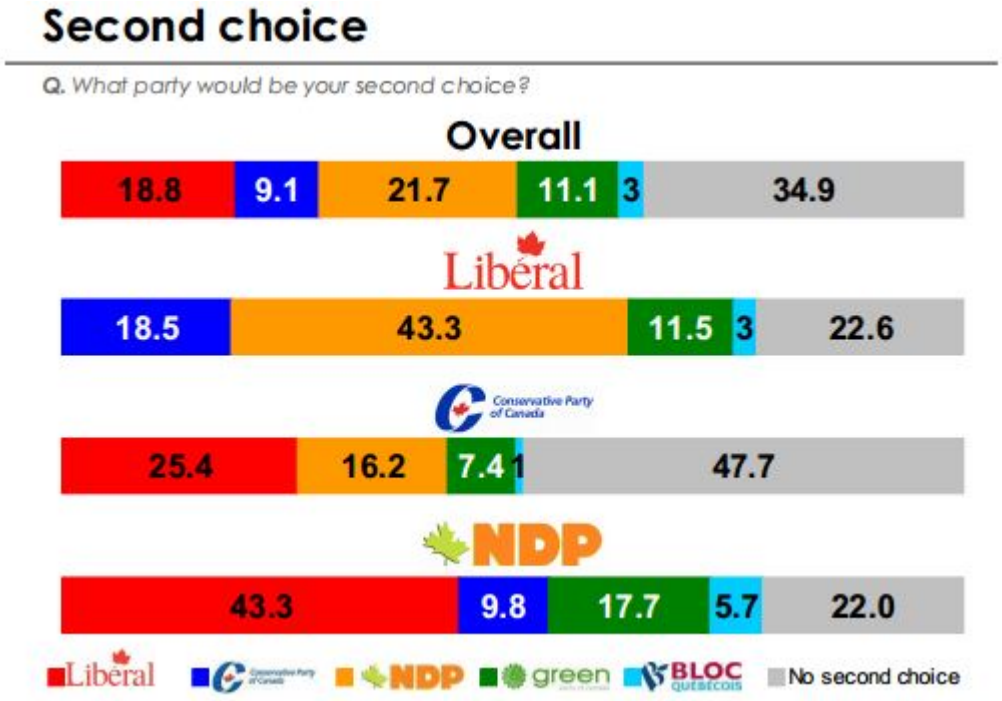
This paper examines the closely contested ridings in the 2011 Canadian Federal Election and models the elections of the MPs in those ridings under EV. The model is simplified to include only the three dominant parties, the Conservatives (C), the Liberals (L), and the NDP (N). Since the Bloc Québécois and the Green Party won 5 seats combined, the total seats of 308 were reduced to 303. The voting population was also reduced to 13 124 050, those who voted for the three dominant parties which accounts for 89.16 percent of the total voting population. Using the adjusted population, new popular vote percentages were calculated. The adjustments are summarized in Table 10.

Table 10: Adjusted Results

Party	Number of Seats	Seat Vote Percentage	Popular Vote Percentage	Absolute Difference
Conservative	166	54.79	44.44	10.35
Liberal	34	11.22	21.21	9.99
NDP	103	33.99	34.35	0.36
Total	303	100.00	100.00	20.70

Ekos Politics conducted a survey that posed several questions including the following: "what party would be your second choice" (2013)? The results of this survey were compiled and yielded the data shown in Figure 3 below.

Figure 3: Second Choice



Source: (Ekos Politics 2013)

The model for the 2011 Canadian Election under EV uses Ekos Politics' data on the Conservatives, the Liberals, the NDP, and the 'no second choice.' The percentages of the dominant parties are added up in each row (except in the row labelled 'overall'), and the sum is taken to equal 100 percent. Using this adjusted 100 percent, new percentages are computed to determine the proportions of the population corresponding to each particular preference relation. For example, to determine the proportion that have a preference relation C>L>N, the following steps are taken. First, we add up 25.4 percent, 16.2 percent, and 47.7 percent, which equals 89.3 percent. Then we set 89.3 percent to 100 percent and calculate the new percentages for the second choices: 25.4 percent becomes 28.44 percent, 16.2 percent becomes 18.14 percent, and 47.7 percent becomes 53.42 percent. The 28.44 percent represents voters with a preference relation C>L>N, the 18.14 percent represents C>N>L, and the 53.42 percent represents C with no second choices. Similar calculations are made for the other columns. The results are summarized in Table 11.

Table 11: Preference Relations

	Percentage of Voters								
Ranking	28.44	18.14	53.42	21.92	51.30	26.78	13.05	57.66	29.29
1st (+1)	C	C	C	L	L	L	N	N	N
2nd (0)	L	N		C	N		C	L	
3rd (-1)	N	L	L,N	N	C	C,N	L	C	C,L

Out of those individuals who selected C as their first choice in a particular riding, under EV, the model assumes that 28.44 percent would rate L as indifferent and disapprove of N, 18.14 percent would rate N as indifferent and disapprove of L, and 53.42 percent would disapprove of both L and N. A candidate ranked first receives 1 point, one who is ranked second receives none, and one who is ranked third receives -1 point.

To calculate the total points for each candidate, these percentages were then applied to specific ridings. Consider the riding Fleetwood Port Kells where the Conservatives won. 23 950 people voted Conservative, so 6811 people, 28.44 percent of 23 950, represent those with the preference relation C>L>N. Tables 12 and 13 show the results of the riding under EV.

Table 12: Fleetwood Port Kells I

Number of Voters								
23950			8041			16533		
6811	4345	12794	1763	4125	2153	2158	9533	4843
C>L>N	C>N>L	C>L,N	L>C>N	L>N>C	L>C,N	N>C>L	N>L>C	N>C,L
Approval, Indifference, and Disapproval Points								
6811	4345	12794	0	-4125	-2153	0	-9533	-4843
0	-4345	-12794	1763	4125	2153	-2158	0	-4843
-6811	0	-12794	-1763	0	-2153	2158	9533	4843

The bottom three rows of Table 12 represent the number of points each party receives, the first row being Conservative, the second Liberal, and the third NDP. For instance, 1763 people have the preference relation L>C>N, so they each award the Liberals +1 point, the Conservations 0, and the NDP -1. Therefore, the Liberals receive 1763 points, the Conservatives 0, and the NDP -1763. If the preference relation does not include a second choice, the model assumes that the voter disapproves of all other candidates. Consider the 4843 voters with the preference relation N>C,L. Each of these voters would award +1 point to the NDP, and -1 point to both the Conservative and the Liberal. Therefore, the NDP would receive 4843 points, while both the Conservatives and Liberals would receive -4843 points. Adding up the horizontal sums of the bottom three rows, the Conservatives win the riding with 3296 points, as shown in Table 13.

Table 13: Fleetwood Port Kells II

Party	**Total**
C	**3296**
L	-16099
N	-6987

However, in more closely contested ridings, this was not always the case. For example, the riding “Etobicoke Centre” was also won by the Conservatives, but under EV, the Liberals would have won as shown in Tables 14 and 15.

Table 14: Etobicoke Centre I

Number of Voters								
21644			21618			7735		
6156	3926	11562	4739	11090	5789	1009	4460	2266
C>L>N	C>N>L	C>L,N	L>C>N	L>N>C	L>C,N	N>C>L	N>L>C	N>C,L
Approval, Indifference, and Disapproval Points								
6156	3926	11562	0	-11090	-5789	0	-4460	-2266
0	-3926	-11562	4739	11090	5789	-1009	0	-2266
-6156	0	-11562	-4739	0	-5789	1009	4460	2266

Table 15: Etobicoke Centre II

Party	**Total**
C	-1961
L	**2855**
N	-20511

In the riding "Etobicoke Centre", the Liberals win with 2855 points under EV. Using a Microsoft Excel spreadsheet, the results were computed in 38 closely contested ridings. Out of the 38 ridings that were modeled under EV, the Conservatives retained 19 of the ridings, the Liberal gained 15 of the ridings and the NDP gained 4 of the ridings. The results are summarized in Table 16.

Table 16: Model Results

Party	**Number of Seats**	**Seat Vote Percentage**	**Popular Vote Percentage**	**Absolute Difference**
Conservative	147	48.51	44.44	4.07
Liberal	49	16.17	21.21	5.04
NDP	107	35.31	34.35	0.96
Total	303	100.00	100.00	10.07

There are two main observations derived from the results. First, the Conservatives will only be able to win a minority as they obtained 48.51 percent of the total seat share. Second, the total difference between the seat and the popular vote percentages decreased from 20.70 to 10.07. Therefore, in the 2011 Canadian Federal Election, the gap would have been reduced by about half had EV been used.

The model has at least three setbacks. First, the survey by Ekos Politics was performed in 2013, but the election took place in 2011. If voters' preferences changed significantly over those two years, then there could be distortions in the model and consequently the survey and thus the experiment may not accurately reflect actual preferences in 2011. Regardless, Ekos Politics' second choice graph makes intuitive sense because in 2011, the Liberal and NDP platforms were more similar than in other years.

Second, Ekos Politics' second choice results are averages across ridings, so they are not specific to each. For example, 25.4 percent of Conservative supporters consider the Liberal Party as their second choice. However, whether or not these results are uniformly distributed across ridings remains unknown. In some ridings, this percentage may be much higher but much lower in others. Since the model inherently assumes that these second choice results are uniformly distributed across ridings, the outcome of certain ridings may be distorted. In the future, second choice surveys should be conducted in each specific riding to account for the differences in preferences across Canada.

Third, the exclusion of the Bloc Québécois (BQ), the Green Party (GP), and other smaller parties leads to some discrepancies in the results. However, the BQ and the GP had more similar platforms to the NDP and the Liberals than to the Conservatives. In Quebec, there was a massive rise in NDP votes from places where BQ is usually supported. Furthermore, since the GP supports environmental causes, they were likely opposed to the oil sands in Alberta, which the Conservatives, in general, endorse. Therefore, had the BQ and the GP been included in the model, they may have actually decreased the Conservative vote share, further minimizing the gap between their seat and popular vote percentages.

It is important to note that the Conservatives still won the election as a whole. The reason why the outcome under EV is more desirable than the outcome under PV is that the gap between the seat and the popular vote percentages are reduced, reflecting individuals' preferences more accurately. It is also interesting that under EV, the Liberals gained more seats than the NDP. This makes sense because, ideologically, the Liberals are the second choice of both the Conservatives and the NDP.

The results from the model are not conclusive, but they are telling. If similar second choice polls are conducted before the 2015 Canadian Federal Elections, then EV should be tested again because further research is needed before it can be concluded that EV is in fact superior to other voting methods. Future models should also include the BQ, the GP, and other parties to obtain more accurate results.

Conclusion

This paper first presents Claude Hillinger's theoretical support for EV, particularly EV's superiority relative to PV and IRV. Next, Bart Salisbury's experiment is presented showing that people do in fact engage in evaluative behaviour and often vote strategically. Since EV allows for a more accurate reflection of individuals' preferences, it reduces the incentive to vote strategically in regard to their most and least preferred candidates. Joseph Ornstein's and Robert Norman's paper is then discussed which shows that the frequency of IRV's paradox failures is significant and that such a failure already occurred in Burlington, Vermont. Such failures cannot occur under EV due to its nature of rating candidates. Finally, the paper examines an EV model of the 2011 Canadian Federal Election. The results are significantly different than in the actual election, though they are more desirable because they reflect individuals' preferences more accurately. The evidence presented in this paper is clearly not conclusive in showing that EV is

superior to other voting methods. Further research is needed, but nevertheless, this paper has succeeded in providing at least some support for EV's implementation over the presented voting alternatives.

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Does Canada Have the Dutch Disease?

Shane Bahmann and Matthew Campo

Abstract

This paper evaluates the presence of Dutch Disease in the Canadian economy arising through shocks to oil prices. The analysis consists of two parts: a short-run analysis of employment changes through deindustrialization and a long-run analysis of the impact on manufacturing total factor productivity (TFP). We find that in the short run, Canada is experiencing deindustrialization that is due partly to Dutch Disease and partly to structural change, consistent across most developed OECD countries. The long-run analysis shows that natural resource shocks have a negative effect on manufacturing TFP in turn damaging the competitiveness of the manufacturing sector. Overall, Dutch Disease is a very complex issue that is closely related to structural change. As a result, recent trends in the Canadian economy cannot be entirely attributed to Dutch Disease. Instead, there is a combination of many factors.

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Introduction

The economic phenomenon in which there exists an apparent relationship between natural resource exploitation and the deterioration of manufacturing or agricultural sectors, commonly referred to as the "Dutch Disease," has spawned a vast body of literature. This relationship became apparent following discovery of natural gas deposits in the North Sea region of the Netherlands in 1959 (*The Economist*, 1977). This discovery of natural gas increased revenues in the resource extraction sector and led to the appreciation of the Dutch Guilder. The appreciation of the Guilder resulted in a decrease in comparative advantage and initiated a process of deindustrialization, which occurs as the result of contracting employment levels in the manufacturing sector. Today, the term "Dutch Disease" is used as a general term to describe the economic changes observed in the Netherlands. That is, the Dutch Disease occurs when a country experiences a positive wealth shock, or 'boom', such as resource discovery or resource price shocks, that appreciates a country's currency. As a result, employment begins to shift away from other economic sectors, such as the manufacturing sector, and toward the booming natural resource sector. In turn, this employment shift leads to an overall decrease in productivity of the non-booming sector due largely to the effect of workers being unable to build upon learning-by-doing skills. In the long run, as the initial wealth

shock begins to taper and the supply of natural resources begins to decrease, employment begins to shift back to the sectors in which it originated. At this point, the economic sector that experiences productivity losses becomes less competitive and now operates on a much smaller scale and as a result, the economy is left in a worse position relative to its starting point. This is due to the fact that resource wealth can create temporary gains but the long-run loss in productivity may outweigh the benefits of the initial wealth shock.

Much interest is derived from the observation that growth of resource-abundant countries is typically slower than less resource-abundant countries and the discrepancy is commonly attributed to the existence of natural resources (Sachs and Warner, 2001). This is intriguing. Associating resource wealth with negative effects appears counter-intuitive, as any type of wealth should seemingly be beneficial. In Canada, expansions in oil production and the related employment levels concurrent with higher world oil prices, an appreciating Canadian dollar, and a decrease in manufacturing employment levels has often been attributed to the Dutch Disease. Recently, there has been much debate over the existence of the condition within Canada and whether the observed changes can be attributed to structural change or Dutch Disease.

This paper will analyze the short-run effects on employment and long-run effects on total factor productivity in the Canadian economy primarily as a result of oil price shocks. Given the time frame of our analysis, we will not consider natural resource discovery as a mechanism of Dutch Disease. This is primarily due to significant discoveries of oil in Canada, which occurred much earlier in the 20th century. Instead, our research will focus on modern (late-20th century onward) oil price fluctuations as a potential mechanism of Dutch disease in Canada. In the short run, we aim to identify the presence of employment shifts from the lagging manufacturing sector to the booming natural resource sector and employment shifts from the manufacturing sector to the non-traded services sector, hereafter referred to as direct and indirect deindustrialization, respectively. Over time, as the initial wealth shock dissipates, finite natural resources become less cost-effective to extract and there may be a transition of employment back to the manufacturing sector. If productivity in manufacturing does not increase with this transition, or if productivity takes many periods to return to high levels, then we may state that Dutch Disease effects are present and have a negative impact on the economy. This serves as a basis to analyze any long-run productivity effects and assess whether those effects are permanent. We hypothesize that in the short run the Canadian economy is experiencing deindustrialization. Additionally, in the long run there will be a productivity decrease that is consistent with Dutch Disease. Based on the results of this analysis, judgment can be made with regard to the current state of the Canadian economy and the relevance of the disease. Our analysis will conclude that only part of the theoretical model for Dutch Disease holds within Canada and the changes observed are consistent with both portions of the Dutch Disease theory and structural trends that are common among nearly all OECD countries.

The structure and organization of this paper is as follows. Section I presents a review of relevant literature associated with our research objectives, including the core theoretical

model that motivates our hypothesis. Section II will present our estimation methodology and provide a justification for the choice of variables. Section III will describe data used and sources. Section IV present empirical results and discussion. Finally, Section V will consist of a conclusion as well as identification of possible areas of further research.

I. Dutch Disease and Literature Review

I. A. Theoretical Model

There are numerous studies that have been undertaken within the Dutch Disease literature. In fact, much of the research performed on the 'disease' has been isolated to developing countries, and despite research focusing on developed countries such as Russia, Norway, and the UK, evidence from Canada on a national level is scarce. These papers are primarily founded upon the "core model" set forth by Corden (1984) [See Appendix 1]. Corden presented the theoretical model that provides the essential knowledge required to study the base mechanisms of this economic phenomenon. The initial effects of a resource discovery induce a shift in labour, seen through employment shares in the lagging and booming sector. The employment shift from the lagging to the booming sector is defined as direct deindustrialization, which does not require the real exchange rate to fluctuate and is not affected by the non-traded sector. Similarly, indirect deindustrialization is defined as the shift of employment from the lagging sector to a non-traded sector as a result of the boom, which increases the opportunity cost of workers in lagging sectors as they can earn higher wages in the non-traded and booming sectors. For the purposes of this paper, we will consider manufacturing as the lagging sector, industries related to natural resource extraction as the booming sector, and the service industry will comprise the non-tradable sector. These will be used to identify short-run deindustrialization through an evaluation of employment levels.

In addition, the core model highlights long-run effects as a result of this deindustrialization in relation to Dutch Disease. Specifically, the long-run effect is that the booming sector competes for scarce factor inputs with the lagging sector, which diminishes productivity and size of the lagging sector. This broad theoretical prediction is extended by Balassa (1964) and Samuelson (1964) who study the effect that productivity has on real exchange rates. The relationship between productivity and exchange rates is commonly referred to as the Balassa-Samuelson effect, which states that a decline of international competitiveness can be compensated by profits to natural resource exports. However, in the long run natural resource extraction is unsustainable due to scarcity of natural resources. As a result, once these natural resources are no longer available for export, and the country begins to shift emphasis back to manufacturing as a primary economic activity, the manufacturing sector will not be competitive enough due to productivity losses and because of this, the country will become a net importer, thus lowering real GDP. This theoretical prediction only holds if deindustrialization slows the growth in total factor productivity (TFP) for manufacturing and TFP is slow to recover. Lower levels of TFP have the potential to damage the comparative advantage for Canadian manufacturers and as a result international trade will decrease, as countries

would not find it mutually beneficial to trade with Canadians. This effect on TFP begins in the short run. However, it has long-run implications for trade. For this reason our paper will refer to the TFP effects as a long-run analysis. Overall, this extreme effect can cause a permanent economic contraction and the resource blessing evidently has the potential to become a curse. This has provided an opportunity for empirical research to measure the contraction of lagging sectors and long-run effects in relation to productivity.

I. B. Empirical Research

The theoretical literature has created a strong framework that is able to support empirical research relating to Dutch Disease. A majority of this research aims to validate theoretical conclusions made by Corden and Neary (1982), Balassa (1964) and Samuelson (1964) at various scales. Cross-country comparisons, single country, regional, and specific symptom analysis are the most commonly used approaches within the empirical literature to substantiate the Dutch Disease hypothesis. These studies will prove to be important to our own research, as they will provide valuable insight into the statistical methods and data required to answer our research question.

The basis of our research will focus on Canada at the national level. Using data from the United States, Raveh (2013) shows that jurisdictions have the ability to use institutions and low mobility costs to mitigate the impact of Dutch disease. This issue is often referred to as the 'Alberta effect,' and occurs when a province can use low tax levels to create an attractive business environment. However, the impact of the disease would still exist on a national scale due to the loss of manufacturing in other provinces. This abstraction allows us to judge the gains or losses to the Canadian economy as a whole, rather than identifying provincial winners and losers.

The prevalence of deindustrialization does not have any positive or negative implications associated; instead it serves as an indicator as to whether the initial stages of Dutch Disease are present in the economy. Matsen and Torvik (2005) show that the disease is only damaging if manufacturing generates learning-by-doing (LBD). LBD is non-transferable across industries and has a direct relation to output in an industry. Theoretically, LBD is included in the total factor probability (TFP) aspect of calculating output, where $Y=AL^{\alpha}K^{1-\alpha}$ (A=TFP, L=Labour, K=Capital). This paper will focus on the impact of deindustrialization on TFP or equivalently, multifactor productivity (MFP).

II. Methodology

II. A. Short-Run (Employment) Methodology

The short run analysis will be structured upon methodology used in Rudd (1996), in which the dependent variable is the lagging sector. For developed countries, this is most often the manufacturing sector. This dependent variable is expressed as a function of the spending effect as well as the resource movement effect, which are the two effects responsible for the disease. Within the model, Rudd (1996) uses the contribution of

manufacturing to non-oil GDP. However, the empirical research aims to determine the extent to which Dutch Disease is responsible for the contraction within the lagging sector. The regression is set up as follows:

$$Manufacturing = f\ (spending\ effect,\ resource\ movement\ effect)$$

With respect to manufacturing industries, the resource movement and spending effects are equivalent to direct and indirect deindustrialization respectively. Our empirical analysis has been centered on employment levels rather than contribution of a sector to non-oil GDP. This is because our short run analysis aims to identify the presence of Dutch Disease rather than the implications of it; labour is an input to all sectors, meaning that regressing employment levels will allow us to identify if the effect of deindustrialization is present. As a result, the dependent variable, manufacturing employment levels, will be expressed as a function of natural resource employment and service sector employment levels:

$$Manufacturing = f\ (natural\ resource\ employment,\ services\ employment) \quad (1)$$

It is important to note that employment levels can only grow for an industry at the expense of another industry. In particular, this analysis of employment levels is careful to include only employment levels for three sectors associated with Dutch Disease. This is to avoid issues of the total employment being modeled in our regressions. If total employment were included this would produce results that are purely mathematical in nature, as employment leaving one industry must increase employment in another. For this reason, the following regressions have intentionally avoided the employment levels of all other industries, other than manufacturing, natural resources, and services, as control variables.

To evaluate the short-run effects of Dutch Disease in Canada we will determine if the Canadian economy is experiencing deindustrialization. To do this we will use the following linear regression:

$$Manufacturing\ Employment = \beta_0 + \beta_1\ (Natural\ Resource\ Employment) + \quad (2)$$

$$\beta_2\ (Services\ Employment) + \ldots + u$$

Both direct and indirect deindustrialization causes employment in the natural resource sector to increase and manufacturing to decrease. We will test the hypothesis that natural resources employment has no effect on manufacturing employment (H0: $\beta 1 = 0$), against the alternative hypothesis that natural resource employment has a negative effect on manufacturing employment (H0: $\beta 1 < 0$). This will provide a clear indication of direct deindustrialization. Moving forward, it must be recognized that direct deindustrialization draws employment away from services (in the same way it draws employment from manufacturing) and indirect deindustrialization draws employment into services, which creates an ambiguous effect as illustrated in Table 1. For this reason, we will test the

hypothesis that services employment has no effect on manufacturing employment (H0': $\beta 2 = 0$) against the two-sided alternative hypothesis that services employment has a relationship with manufacturing employment (H1': $\beta 2 \neq 0$) for indirect deindustrialization. From this we will be able to state that the indirect deindustrialization effect dominates if $\beta 2 < 0$, or that direct deindustrialization dominates if $\beta 2 > 0$. If this holds, then we will be able to conclude that Canada is experiencing deindustrialization.

Table 1: Expected Regression Coefficients

	Manufacturing	Natural Resources	Services
Direct Deindustrialization	Negative	Positive	Negative
Indirect Deindustrialization	Negative	Positive	Positive
Total	**Negative**	**Positive**	**Ambiguous**

In building our model, additional variables that have been included are oil prices, Canadian-US exchange rates and manufacturing imports (consisting of fabricated materials and end products). The reasoning for these variables is drawn directly from Corden's model of Dutch Disease in which the price of oil causes the boom in natural resources and the appreciating exchange rate causes the demand for manufacturing imports to increase. These variables are key components of the theoretical framework and as a result essential to our regression analysis. If these variables are excluded it increases the probability of an omitted variable bias which can lead to incorrect inferences.

Recession and expansion dummies have also been included as control variables. Hall (2005) identifies recession and expansion dummy variables as important factors when analyzing employment fluctuations. In our analysis, these variables are used to ensure employment fluctuations related to business cycles are not misinterpreted as Dutch Disease effects. In a recession, we would expect to see employment levels in natural resource sectors, manufacturing, and services to all decrease and in an expansionary period the opposite would hold. Finally, wages in the economy have been also included because wages are also highly correlated with labour productivity, which has a direct impact on the demand for manufacturing inputs, specifically labour. Using these variables, we will carry out our regression analysis over several steps. This will allow us to identify and discuss the effects that each group of variables has on manufacturing employment and allow us to draw conclusions on the prevalence of Dutch Disease in the economy.

II. B. Long Run (TFP) Methodology

Once the presence of deindustrialization has been established, we can then study the long-term effects of Dutch Disease on productivity. Models used by Iscan (2013) and Baldwin and Gu (2003) have been used to motivate a regression framework for our long-run analysis. Iscan (2013) highlights that the use of manufacturing TFP to study Dutch Disease is optimal due to the elimination of possible endogeneity issues related to labour productivity and structural change in a long-run analysis. Baldwin and Gu (2003) determine the effects of export participation on the productivity of manufacturers, with manufacturing TFP as the dependent variable and expressing it as a function of dummies for exporters, new exporters, or previous exporters. As the aim of Baldwin and Gu (2003) was to determine the effects of export participation on manufacturing TFP, the regressions used in our paper will differ slightly.

Our analysis will determine the effects of mining output on manufacturing TFP; therefore mining output will be used as an independent variable rather than an exporting dummy:

$$Manufacturing\ TFP = f\ (Mining\ Output)$$

Our initial regression will use manufacturing TFP as the dependent variable and current mining output and lagged mining output as the independent variables:

$$Manufacturing\ TFP_t = \beta_0 + \beta_1\ (Mining\ Output)_t + \beta_2\ (Mining\ Output)_{t-1} + \ldots + u \quad (4)$$

We will test the hypothesis that lagged mining output has no effect on manufacturing TFP (H0: $\beta 2 = 0$) against the alternative hypothesis that lagged mining output has a negative effect on TFP (H1: $\beta 2 < 0$). If we reject the null hypothesis, then mining output will have a negative relationship with manufacturing TFP in the long run.

As this long-run analysis will focus on the effects of past mining output, lagged variables will also be used to test the results over a longer time period. We have tested several time periods of mining output in relation to manufacturing TFP to determine which time period has the most significant lag effect [See Appendix 3]. For our analysis, we will use a lag of eight periods (years) to assess the lagged mining output effects on manufacturing TFP. Additional control variables that will be included are: the cost of labour, the cost of capital, and capital to labour ratio. Baldwin and Gu (2003) illustrate that the productivity of labour and capital are represented by the costs in the manufacturing sector, because of this, changes in each may control for variations in TFP that did not arise as a result of mining output. Finally, the capital-to-labour ratio has been chosen to account for the variation in TFP that arises from varying allocations of resources to capital and labour levels. This is justified by the analysis undertaken by Baldwin and Gu (2003).

III. Data

Our analysis focuses on results from two data sets. This is necessary as the second set provides published levels of TFP. Although TFP values can be calculated using the first data set, values of capital and labour do not exist on a quarterly basis, and the available data would reduce the number of observations to an undesirable level. Additionally, data for labour inputs and output do exist from the first data set, however; the values from CANSIM table 383-0022 are preferred from a consistency perspective as opposed to manipulating the data repeatedly. Detailed definitions, numerical interpretations, and sources of data used are available in the supplementary material section.

III. A Data Set 1

The first data set consists primarily of quarterly Canadian economic variables from the first quarter of 1981 to the third quarter of 2013. This equates to a total of 131 data points for variable categories such as productivity measures, real gross domestic product, resource prices, and employment levels by industry. These have been compiled into a single data set using various data tables derived from Statistics Canada's CANSIM database with the exception of crude oil price data, which is sourced from the United States Energy Information Administration. This data set will be used to analyze short-run labour movements in connection with the Dutch Disease.

Employment levels by North American Industry Classification System (NAICS) and total Canadian employment are derived from CANSIM table 282-0088. This table presents monthly survey estimates of employment by industry measured in thousands of people. We used a basic calculation to average the monthly data to create quarterly observations. To isolate for labour share by NAICS, we have divided specific industrial classifications by all industry employment to determine the proportion of employees employed by a specific sector. For example, manufacturing employment share is calculated by dividing employment in the manufacturing sector by employment in all industries. Although these shares are not used in the regressions they do motivate research into Dutch Disease in Canada, and can be seen in Appendix 2.

Oil price data were collected from the United States Energy Information Administration quarterly publications. The West Texas Intermediate (WTI), which is traded from Cushing, Oklahoma serves as a commonly accepted benchmark of oil spot prices. Due to the proximity and influence of this market to Canadian consumers it is reasonable to assume that the prices in this market have a significant influence on not only Canadian oil prices but also the entire economy.

Monthly *foreign exchange rate* data for Canadian cents per United States dollar have been taken from CANSIM table 176-0049. These exchange rates are significant as the United States is a major export trading partner for Canada (Industry Canada, 2013). Inclusion of this variable may help control for any possible fluctuations in the economies of major Canadian trading partners that may impact our analysis. However, any

regressions using exchange rates will be looked at through an uncertain lens as they are influenced by a variety of volatile factors. By using a simple average, we have translated this monthly data into quarterly points.

Dummy variables for *recession and expansion* have been derived from an analysis of real GDP growth between quarters calculated from CANSIM Table 379-0007. The recession and expansion dummy variables allow us to control for business cycle effects within our model. A recession is defined as two consecutive quarters of negative real GDP growth. There are four recessions within our analysis timeframe: Q3-1981 to Q4-1982, Q3-1986 to Q4-1986, Q2-1990 to Q1-1991, and Q4-2008 to Q3-2009. An expansion is the portion of a business cycle, which is defined as the period between post-recession recovery and next peak in real GDP growth. There are four periods of expansion within our analysis: Q1-1984 to Q4-1985, Q1-1987 to Q2-1988, Q1-1994 to Q1-1995, and Q4-2010 to Q1-2011. By definition, recessions are timeframes in which there exists at least two consecutive quarters of negative economic growth.

Productivity data and related variables such as labour compensation (*wage*), were collected from CANSIM table 383-0008, which is indexed on a seasonally adjusted quarterly basis setting the base year 2007 as 100. These data are collected using a variety of mandatory surveys and then adjusted for consistency with annual accounts. *Manufacturing imports* were obtained from CANSIM table 228-0002 and are measured in millions of Canadian dollars. The values used were from the balance of payments accounts, and is a combination of section 4 and section 5 imports: fabricated materials, and end products both inedible. In the regression these variables will be tested independently as end products are expected to compete with domestic manufactured goods. Fabricated material imports can be used as inputs and may be positively related to domestic manufacturing. Thus, the result for manufacturing imports may only show the combined results and not be accurate in depicting the whole relationship.

III. B. Data Set 2

The second data set consists of yearly data from 1977 to 2008, resulting in 32 observations. The majority of this set of data is comprised of values from CANSIM table 383-0022. It contains data on real gross output for mining (*mining output*), and *cost of capital* (both in millions of Canadian dollars). As well, labour compensation (*wages*); capital and labour inputs (capital/labour = *capital-to-labour ratio*) and TFP/MFP (all of which 2002 is the base year = 100) for each of the three industries are included in the table. *Manufacturing TFP* is published under the title Multifactor productivity, which serves as a measure of evaluating the changes in output per unit of combined inputs. As a majority of these data are supplied only in yearly sets, the numbers of data points are limited. However, it is fundamental in our long-run analysis of productivity impacts.

IV. Empirical Results and Explanation

The following section includes the empirical results of our research using each data set to evaluate the effects of Dutch Disease within the Canadian economy. Summary statistics for each data set, detailed definitions, and numerical interpretations of each variable can be found in the supplementary materials section.

IV. A. Short Run Deindustrialization

Table 2 reports our short-run regression results. Column (i) represents initial regressions outlining employment levels without any control variables. The results at this stage are consistent with our hypothesis that deindustrialization is present. It shows the expected effects from the natural resource sector that deindustrialization is present, while the coefficient for service employment suggests that the direct deindustrialization effect is greater than the indirect effect. These initial results motivate further analysis. Since Column (i) yields low R^2 values, this means that the variables used explain only a small part of deindustrialization; therefore, more variable must be included to account for mechanisms that are actively a part of Disease. Our regression in Column (ii) expands upon our initial regression by including oil prices and the exchange rates. With the addition of these variables, changes in employment levels remain consistent with deindustrialization. The inclusion of oil price and exchange rate variables drastically boost the R^2 value from 0.16 to 0.39. Dutch Disease theory suggests that increases in both oil prices and exchange rates should have a negative effect on manufacturing employment. However at this point, our results are inconsistent with the theory due to the fact that both oil prices and exchange rates are reported to have a positive coefficient.

It is important to note that if employment fluctuations are explained by business cycles then the Canadian economy is not suffering from Dutch Disease. Instead, these employment shifts can be explained by structural change. In order to account for this it is important that the expansion and recession dummies are included. In column (iii), after incorporating these variables, the R^2 value shows that business cycles do not fully explain the fluctuations in manufacturing employment. However, they do explain some portion of the employment shifts. It is interesting that the coefficients on natural resource and service employment levels are now both positive, which is not consistent with our hypothesis. Although this regression may not be consistent with our hypothesis, it is consistent with the assumption that economic expansions will increase overall employment in the economy, whereas recessions will decrease overall employment in the economy. Column (iv) builds upon the previous analysis by including wage and manufacturing import information. This regression is motivated by the idea that increases in wage capture some of the effect of deindustrialization as the opportunity cost of workers in the lagging sector is increasing. They can earn higher wages in the non-traded and booming sector. At this point, increasing wages have a significant negative effect on manufacturing employment. This is likely a result of higher wages in either natural resource or services sectors causing employment to shift away from manufacturing jobs. The manufacturing imports variable is included to confirm that a decrease in

Table 2: Short-run Deindustrialization (Manufacturing Employment as Dependent Variable)

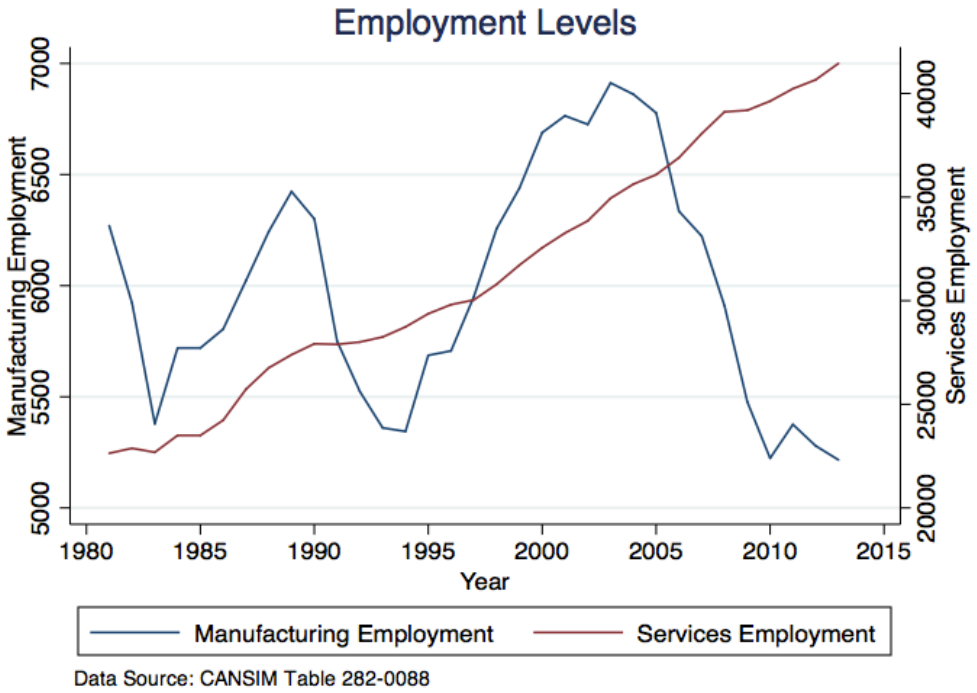
Short-run Deindustrialization (Manufacturing Employment as dependent variable)	**Manufacturing Employment (i)**	**Manufacturing Employment (ii)**	**Manufacturing Employment (iii)**	**Manufacturing Employment (iv)**	**Manufacturing Employment (v)**
Variable	Coefficient (T-statistic)	Coefficient (T-statistic)	Coefficient (T-statistic)	Coefficient (T-statistic)	Coefficient (T-statistic)
Natural Resource Employment	-2.807842*** (-4.97)	-0.0722622 (-0.07)	0.0159752 (0.02)	-0.8766789 (0.69)	-0.4898486 (0.77)
Service Employment	0.014085* (1.75)	0.0195506 (0.92)	0.0093657 (0.43)	0.6397152*** (0.06)	0.6249233*** (0.07)
Oil Prices	-	0.489996 (0.10)	1.186523 (0.24)	-6.673648** (3.17)	-4.825894 (3.54)
Exchange Rate (USD)	-	21.98652*** (4.31)	21.71107*** (4.27)	-4.476569 (5.16)	-4.36565 (5.15)
Expansion Dummy	-	-	-289.5744** (-2.17)	-310.7125*** (83.85)	-292.4973** (85.19)
Recession Dummy	-	-	-153.7555 (-1.05)	-48.23033 (101.38)	-41.7348 (101.37)
Wage	-	-	-	-190.3409*** (14.91)	-185.4725*** (15.48)
Manufacturing Imports (All)				0.0288125*** (0.01)	-
Manufacturing Imports (Fabricated)	-	-	-	-	-0.0105902 (0.03)
Manufacturing Imports (End)	-	-	-	-	0.0406183** (0.01)
Observations	131	110	110	106	106
Constant	8124.411*** (17.18)	2658.726** (2.02)	2968.888** (2.28)	-7.010714 (1584.867)	-293.3205 (1601.56)
R^2	0.1623	0.3911	0.4209	0.78	0.78

Significant at 90% level *
Significant at 95% level **
Significant at 99% level ***

manufacturing employment is coupled with an increase in imports of manufactured goods. This regression yields an R^2 value much higher than previous regressions. The null hypotheses of natural resource employment and service sector employment (H_0: $\beta_1 = 0$ and H_0': $\beta_2 = 0$) are both rejected with 95% confidence, with services sector employment (H_0') being rejected at a 99% confidence level. Column (v) further breaks down manufacturing imports into sub categories: fabricated goods and end goods. Fabricated goods include wood, textiles, chemicals, plastics, and rubber materials, while end goods include items such as engines, drilling and mining equipment, industrial machinery, apparel, and motor vehicles. From our results we observe that fabricated imports have a negative impact on manufacturing employment whereas the import of end goods have a positive effect on manufacturing employment. A possible explanation for these counterintuitive results can be attributed to structural change. When the exchange rate rises, manufacturing employment decreases but it is cheaper to import materials. When the exchange rate drops manufacturing employment increases and more end goods are imported as many industries use these imports, such as machines, for their own manufacturing.

The notion that the direct effect is greater than the indirect effect of deindustrialization is supported by Figure 1 below. There is potentially an effect of indirect deindustrialization in the later periods of the chart, however; it is not clear that there exists strong evidence from indirect deindustrialization. If this were the case services employment would show increases where manufacturing employment shows decreases.

Figure 1: Service Sector and Manufacturing Sector Employment Levels



In discussing our empirical results, the coefficient for manufacturing imports would indicate that there is a positive relationship with domestic manufacturing employment. This is interesting, however, the variable includes imported fabricated materials, not just end materials. Domestic manufacturing requires labour input as well as material inputs, so this finding is not unrealistic. The negative coefficients associated with oil prices and the exchange rates are also consistent with Corden's model of Dutch Disease, as both increase and manufacturing employment decreases. This regression is evidence that Dutch Disease is present in the economy. However, Dutch Disease does not fully explain this short-run deindustrialization. For example, the large negative coefficient for the expansion dummy variable provides evidence of deindustrialization that is strictly due to business cycle fluctuations. The significance of this is that we are able to prove that Canada does not suffer exclusively from deindustrialization caused by Dutch Disease. Instead, we are able to observe that employment shifts are due in part to resource price booms and exchange rate fluctuations as well as business cycle effects. It also shows that without an in-depth examination, the Dutch Disease can easily be mistaken for structural changes.

With multiple variables and various effects working simultaneously, the complexity in diagnosing a specific country with the Dutch Disease is highlighted. In Canada, it is possible to identify the Dutch Disease-related deindustrialization as a mechanism that operates through resource price shocks and exchange rate fluctuations, but only accounts for a small portion of deindustrialization as there are many other factors such as structural change and technological advances that are also responsible for deindustrialization.

Figure 2 supports the conclusion that the observed decreases in manufacturing employment cannot be entirely attributed to Dutch Disease. It is clear that manufacturing employment appears to be cyclical regardless of the behavior of real GDP over the entire timeframe of our analysis. Since oil prices and exchange rates impact manufacturing employment in ways consistent with Dutch Disease, it is important to investigate the long-run productivity effects.

IV. B. Long Run Productivity Impacts

It should be recognized that the implications of the disease varies with the responsiveness of TFP to output of the mining sector. If past levels of mining output show significant relationships to manufacturing TFP, then manufacturing will take a longer period of time to regain the productivity lost from the Dutch Disease. This means that the productivity levels will be below the level it would be at if employment had not shifted as a result of the Dutch disease, and thus hurting the competitiveness of Canada's manufacturers and the Canadian economy. Figure 3 above illustrates the trends of mining output and manufacturing TFP. It is clear that TFP in manufacturing hinders once mining output experiences a boom. This is clear support for the use of lagged mining output as a variable in the regressions. Appendix 3 also provides an empirical justification for our choice of lagged variable. We have regressed several periods of mining output to

Figure 2: Manufacturing Sector Employment Levels and Real GDP

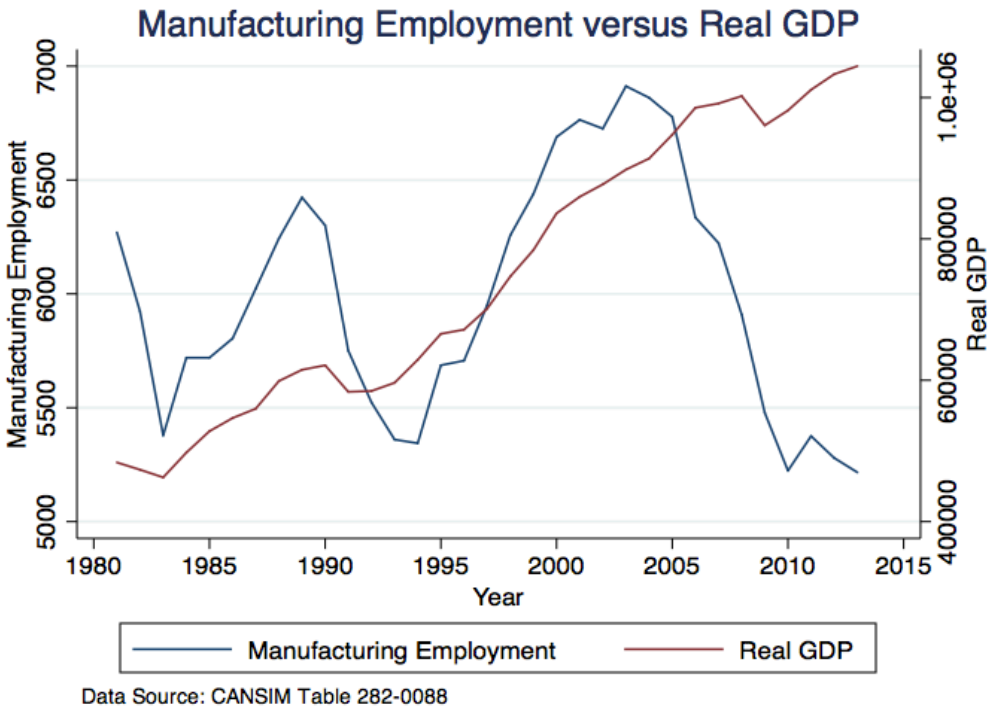
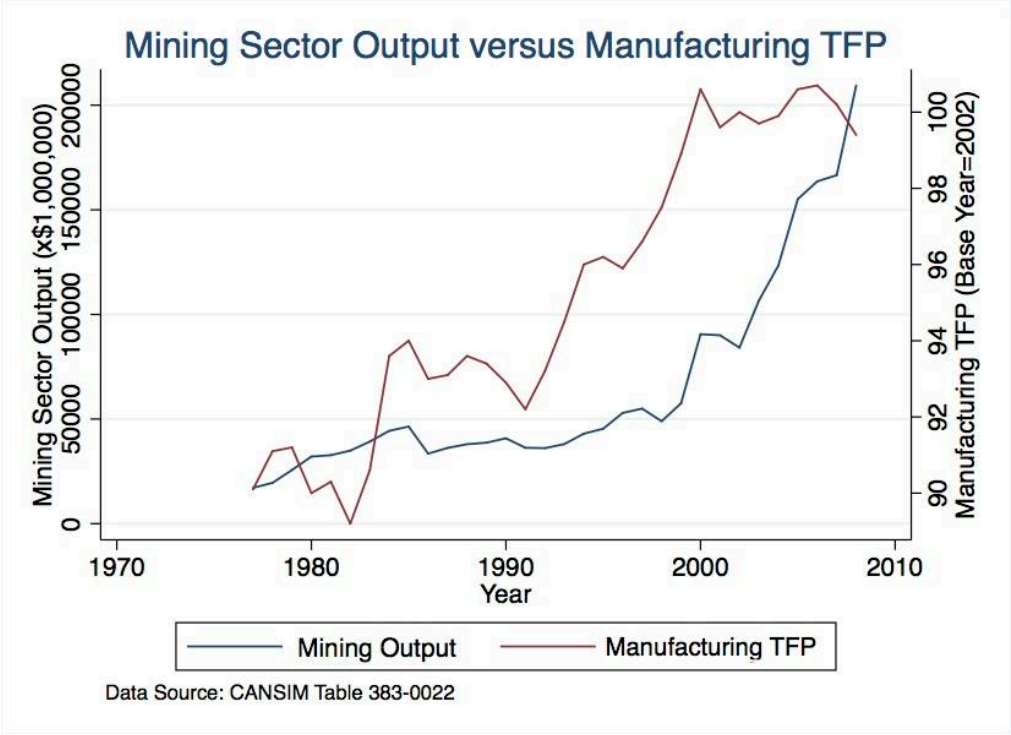


Figure 3: Mining Sector Output and Manufacturing TFP



determine which period contains the most significant lag. As a result, we have selected an eight-year lag (n=8), in our analysis of manufacturing TFP.

The initial regression in Table 3 below, column (i), showing solely the effect of contemporary mining output and mining output eight years in the past provides interesting results. The coefficients imply that contemporary mining output has a significant positive effect on manufacturing TFP but the long run effect is insignificant. The regression in column (ii) shows similar results with a much better fit. The R^2 value is high, and the coefficients on mining outputs are significant. From this regression we are able to reject the hypothesis that mining output has no effect on manufacturing TFP ($H_0 = 0$) and state that mining output has a significant negative impact on manufacturing TFP eight years in the future. It is also interesting that mining output still has a positive relationship with contemporary manufacturing TFP. A possible explanation is that higher incomes in the economy from resource extraction are circulated among domestic businesses, including to manufacturers who spend this on increasing productivity. It is important to note that wages and labour productivity share a very high positive correlation. As a result, the wage variable will also be used to capture labour productivity effects. Finally, with such a high R^2 value it is extremely likely that the coefficient for mining output lagged will not change with the addition of more relevant variables.

This long-run analysis highlights that manufacturing TFP is damaged as a result of a resource price shock. This damage occurs in lagging periods and there is evidence that output from the natural resources sector has a negative effect on manufacturing TFP. The overall effect of this is that in the long run, manufacturing TFP is lower than its potential had it not been affected by a resource price shock. Once again, this may not be entirely due to the Dutch Disease. A factor that might explain part of this observation includes the globalizing nature of business. Although globalization does not geographically bring people closer it reduces communication, transportation, and travel times. As a result, the effects of declining manufacturing TFP may be exacerbated in developed countries since developing countries are able to produce manufactured goods with much lower costs and as a result sell these goods to a wider range of markets at lower prices, thus reducing the demand of manufactured goods from resource abundant countries. With this new competition, investment activities may decline in the manufacturing sector as manufacturers seek to lower costs in order to maximize profits and as a result this is able to explain some of the TFP decline. In Canada, this may be a sign that there has been a loss in competitive advantage to lower-cost producers, which can be problematic far into the future if resources begin to run out and there exists a manufacturing sector that is unable to support new employment. Overall, this decrease in manufacturing TFP is a cause for concern due to the fact that over time it can result in significant losses in manufacturing output. It may be extreme to assume that the manufacturing sector can be lost entirely, but as it declines, it reduces diversification within the economy and a larger proportion of people will become susceptible to shocks in the natural resource and services sector.

Table 3: Long-Run TFP Analysis (Manufacturing TFP as Dependent Variable)

	Manufacturing TFP (i)	**Manufacturing TFP (ii)**
Variables	Coefficient (t-statistic)	Coefficient (t-statistic)
Mining Output[+]	59.80*** (4.40)	17.00*** (5.28)
Mining Output Lag 8 years[+]	-55.10 (-1.14)	-51.80*** (17.40)
Cost of Capital[+]	-	75.10*** (13.60)
Wages	-	0.2722893** (0.1293446)
Capital-Labour Ratio	-	1.629774 (3.350582)
Observations	24	24
Constant	94.41764*** (70.61)	65.38336*** (9.658342)
R^2	0.64	0.98

Significant at 90% level *
Significant at 95% level **
Significant at 99% level ***

+Scaled Values (multiplied by 1,000,000)

V. Conclusion

This paper performed a detailed analysis of the short-run and long run effect of Dutch Disease within Canada. In Canada, Dutch Disease is defined as the apparent relationship between an increase in natural resource extraction and a following decrease in the manufacturing sector. The mechanism in which this operates is a resource price shock that causes extraction in the natural resources sector to increase that which appreciates a country's currency and in turn results in an uncompetitive manufacturing sector. As the supply of finite resources decrease, the economy is left in a worse off position as they are left with a weak manufacturing sector and few natural resources. In

Canada, we have found that this is a very complex issue. However, there is significant evidence that the Dutch Disease exists. It is important to understand that the observed changes related to Dutch Disease are closely related to structural and technological changes such that the symptoms of Dutch Disease only account for a small portion of change within the Canadian economy. Additionally, the long-run analysis supports the hypothesis that the deindustrialization is having a harmful effect on the productivity of Canadian manufacturers. It is very likely that these negative effects on manufacturing will harm the competitiveness of Canadian manufacturers, although that depends on the productivity of foreign manufacturers and such statements would require further research.

It should also be noted that growth in employment is rare among OECD countries (Bernard, 2009), and a corollary is that it must be admitted that the observed deindustrialization in Canada may result from a form of 'natural' deindustrialization that arises as countries develop. Interesting findings may arise from comparing the trends in Canadian manufacturing to those of other OECD countries in future research. Additional mention should be made of the exchange rate. The exchange rates are impacted by many factors in addition to the demand and supply for imports. Examples of these are any activities that may change the value of the United States dollar. Its position as a global currency adds extra volatility to the variable and relationships with manufacturing employment may arise from unobserved factors.

Despite these points, the findings of this paper show trends which are consistent with Dutch disease and find a negative relationship between similar trends and TFP in the long term. Regardless of whether Dutch disease is the causing factor behind these findings or not, the outlook for productivity in Canada's manufacturing sector is not favorable and the situation is made no better by the economic emphasis on the natural resource sector.

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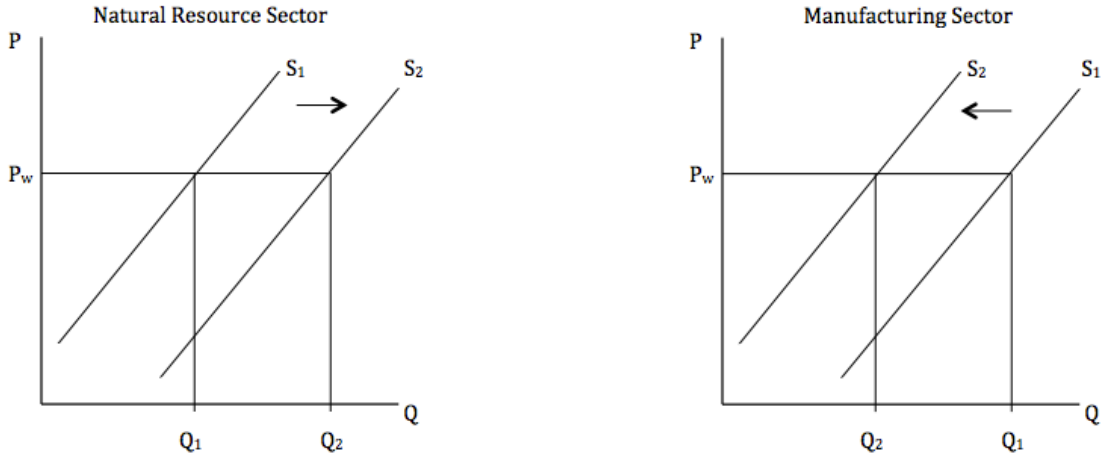
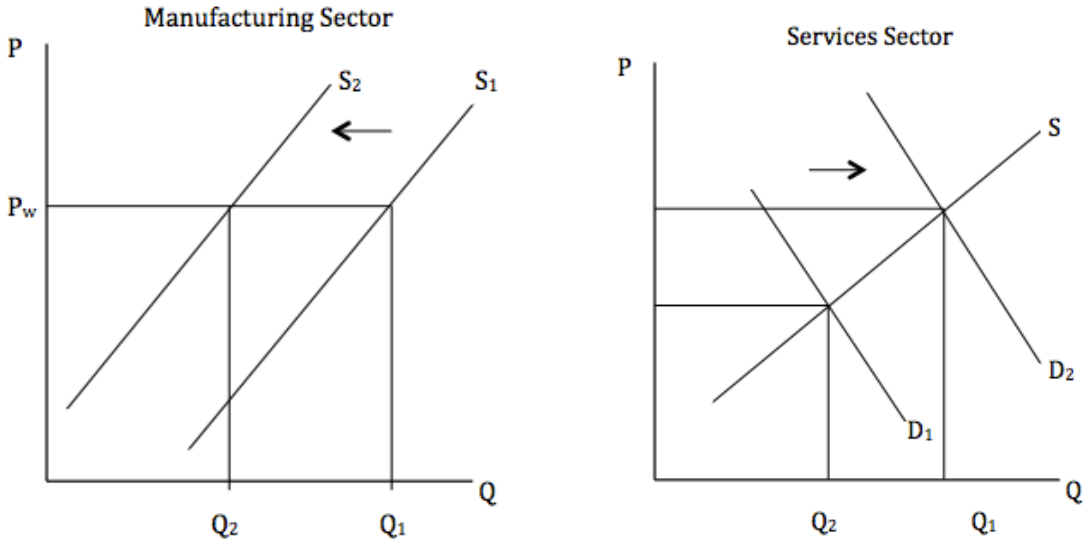
Appendices

Appendix 1: Graphical Representation of Corden Model

A price boom in the natural resource sector causes the profits to increase within that sector. As a result of the increase in profits, the marginal product of labour increases and this translates into a wage increase in that sector. Labour supply moves from manufacturing and services (impact on services is not depicted) to the natural resource sector. This shift in labour is called the *Resource Movement Effect*, or *Direct Deindustrialization*:

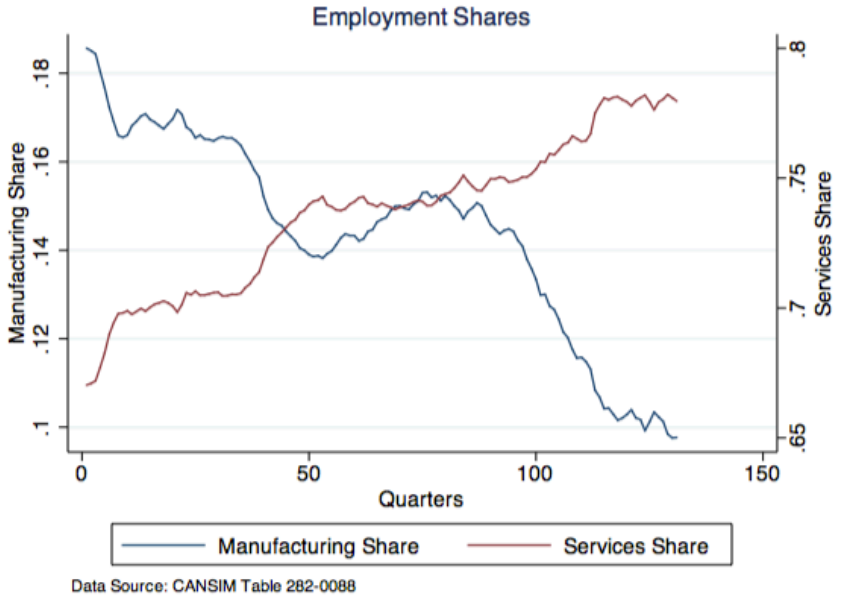


Additionally, the increase in wages to labour in the natural resource sector causes higher incomes for consumers in the economy. This income is spent on non-traded goods; in this case services. The extra income increases the demand for services, resulting in higher prices and quantities demanded of services, and the service sector also has an increase in profits. This results in higher marginal product of labour, and increase wages in the services sector. Labour also transitions out of manufacturing and into the services sector. This effect is called the *Spending Effect*, or *Indirect Deindustrialization*:

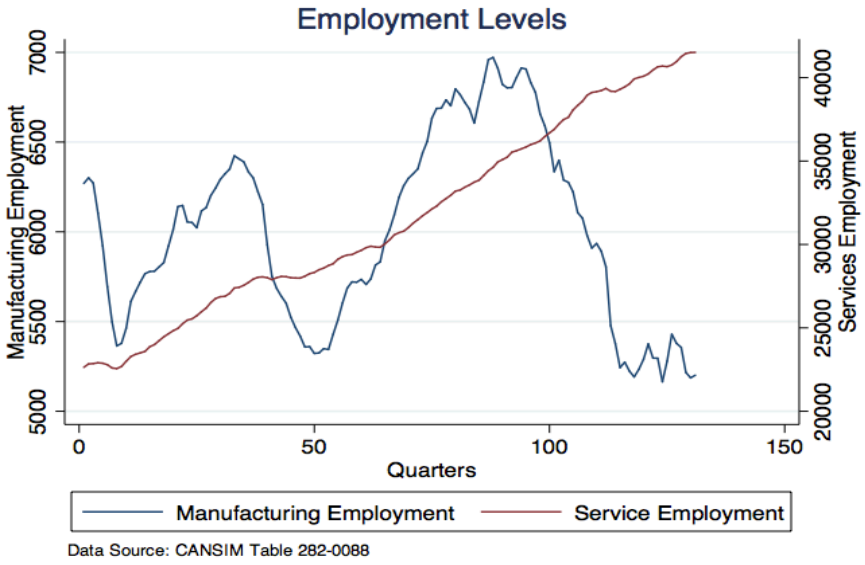


Appendix 2: Additional Deindustrialization Evidence

'Indirect Deindustrialiation'

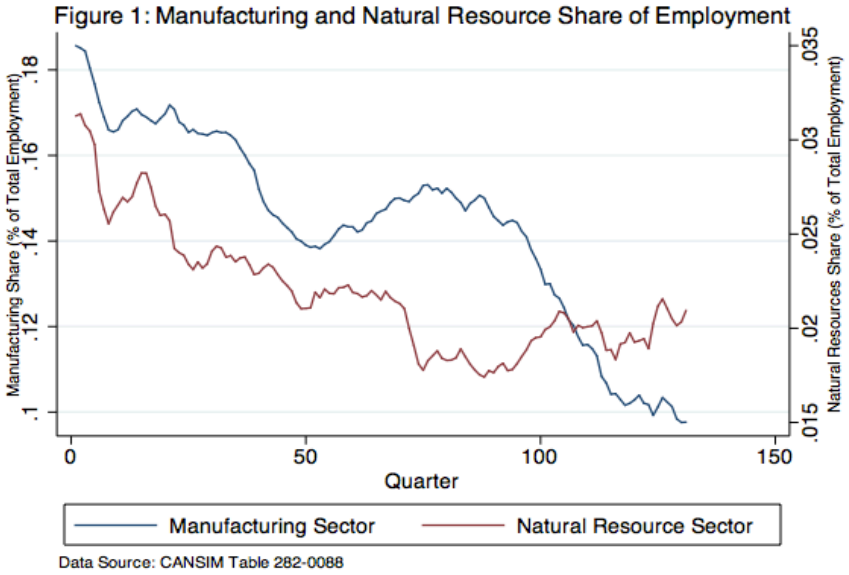


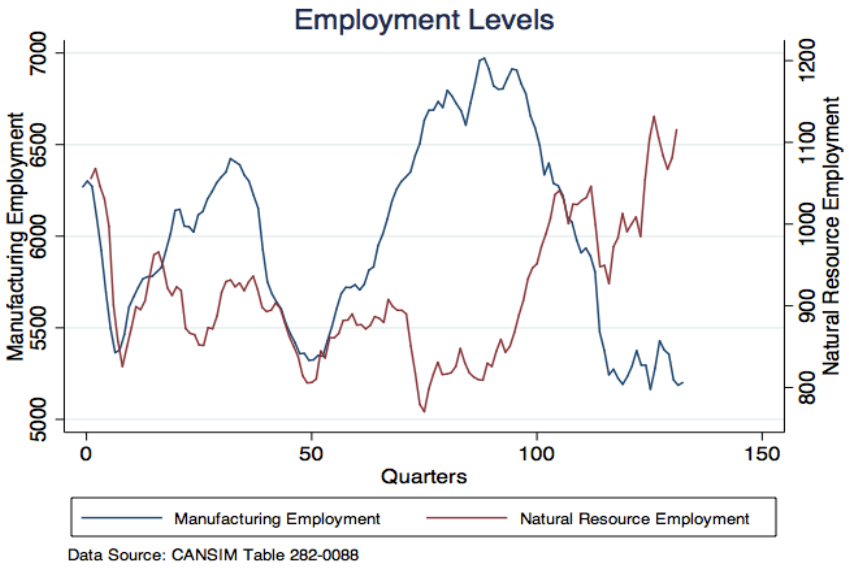
Data Source: CANSIM Table 282-0088



The graph depicting employment shares as an excellent example of indirect deindustrialization. Although the axes have different scales, a loss of manufacturing employment share is concurrent with a gain in service share of employment. Despite this, the employment levels chart does not depict the same story, it is much more likely that the deindustrialization from the first graph is structural, the loss of manufacturing employment in the later quarters may be related to the gain in service employment, however; such conclusions would be speculation.

'Direct Deindustrialization'





Over the entire time period of employment shares it is difficult to establish a connection between manufacturing and natural resource employment. However, following from approximately 2005 (n=100) it is clear that natural resources experience a boom in employment, while the manufacturing sector shows a quick drop in employment levels. Unlike the evidence of *Indirect Deindustrialization*, the graph of employment levels supports this as well. The decrease in manufacturing employment occurs within a very close time period of natural resource employment increasing.

Appendix 3: Lag Analysis (Long Run)

Column (i) shows the relationship of mining output and manufacturing TFP for 10 lags and a t^2 variable was chosen as the mining output shows an exponential trend. In this column it is clear that the eighth lag is significant, and is even significant in Columns (ii) and (iii) both showing high R^2 values. Although the contemporary mining output is not significant in any of these regressions, it was still chosen as a variable in the long run empirical analysis in order to separate the long run and short run effects on TFP. The t^2 value was not included, as the manufacturing TFP did not show a specific trend.

	I	**II**	**III**	**IV**
	Coefficient *(T-statistic)*	Coefficient *(T-statistic)*	Coefficient *(T-statistic)*	Coefficient *(T-statistic)*
Mining Output	-5.33e-06 *(-0.18)*	0.0000113 *(0.18)*	-	-5.98e-07 *(-0.07)*
L1.	-0.0000346 *(-1.30)*	-	-	-
L2.	4.66e-06 *(0.17)*	-	-	-
L3.	0.0000174 *(0.58)*	-	-	-
L4.	0.0000328 *(1.01)*	-	-	-
L5.	0.0000373 *(1.78)*	-	-	-
L6.	-4.66e-06 *(-0.10)*	-	-	-
L7.	-0.0000542 (-1.34)	-	-	-
L8.	-0.0000786* (-2.15)	-0.0001119*** *(-5.91)*	-.000098*** *(-5.51)*	-
L9.	-0.0000685 *(-1.56)*	-	-	-
L10.	0.0000161 (-0.38)	-	-	-
t^2	.0001683*** *(4.89)*	.0001285*** *(11.29)*	.0001408*** *(15.47)*	0.0000969*** *(9.22)*
Constant	-568.4308*** (-4.16)	-411.631*** *(-9.81)*	-460.3503*** *(-12.89)*	-289.6022*** *(-7.01)*
R^2	0.9844	0.9513	0.9444	.90511
Obs.	22	24	24	32

*Significant at 90% level **
*Significant at 95% level ***
*Significant at 99% level ****

Supplementary Material: Summary Statistics and Variable Definitions

1) Data Set #1: Short-Run Variable Statistics

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Manufacturing Employment	131	6000.308	521.9276	5164.4	6971.5
Natural Resource Employment	131	914.84	82.27	770.40	1131.70
Oil Price	110	39.76	29.03	12.94	123.95
CAD-USD Exchange rate	131	126.55	16.15	96.76	159.44
Service Employment	131	31502.99	5779.81	22557.40	41517.00
Manufacturing Imports	126	52897.39	26474.43	12932.5	97119.8
Manufacturing Imports (Fabricated)	126	12940.09	7399.585	2897.8	28318.9
Manufacturing Imports (End)	126	39957.3	19244.74	9771.8	69139.8
Wage	130	73.46079	22.73256	34.628	116.099
Recession (Dummy Variable)	131	0.122137	0.328701	0	1
Expansion (Dummy Variable)	131	0.160305	0.368297	0	1

*Natural resource sector employment includes mining, fishing, forestry, quarrying, oil, and gas.
*Observations are measured quarterly from 1981 to 2013.

1) Data Set #2: Long-Run Variable Statistics

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Manufacturing TFP	32	95.24375	3.783746	89.2	100.7
Mining Output	32	65051.94	48806.64	17126.2	209435.5
Cost of Capital	32	47575.48	25270.5	11354.7	90972.5
Wages	32	94.29062	5.621523	85.5	103.4
Capital-Labour Ratio	32	0.8877311	0.1353433	0.6513762	1.149123

*Observations are measured yearly from 1977 to 2008.

3) Variable Definitions

Variable	Source	Definition and Numerical Interpretation.
Natural Resource Employment	CANSIM Table 282-0088	This sector comprises establishments primarily engaged in extracting naturally occurring minerals (NAICS 21). [Numerical interpretation is persons x 1,000].
Manufacturing Employment	CANSIM Table 282-0088	This sector comprises establishments primarily engaged in the physical or chemical transformation of materials or substances into new products (NAICS 31-33). [Numerical interpretation is persons x 1,000]
Service Employment	CANSIM Table 282-0088	This sector comprises establishments primarily engaged in service activities identified in NAICS 41 to NAICS 91. This includes activities such as banking, professional services and educational services (NAICS 41-91). [Numerical interpretation is persons x 1,000].
Oil Prices	United States Department of Energy Information	West Texas Intermediate (WTI) – A crude stream produced in Texas and southern Oklahoma which serves as a reference or "marker" for pricing a number of other crude streams and which is traded in the domestic spot market at Cushing, Oklahoma. [Numerical interpretation is US$ per barrel].
CAD-USD Exchange rate	CANSIM Table 176-0049	Value of Canadian currency for purposes of conversion to United States Dollar. [Numerical interpretation is Canadian cents per United States Dollar]
Manufacturing	CANSIM Table	Summation of sections 4 and 5 from the Balance of Payments

Imports	228-0002	reported imports: fabricated materials inedible, and end products, inedible.
Manufacturing Imports (Fabricated)	CANSIM Table 228-0002	Section 4 inedible fabricated materials. Includes several groups such as wood, textiles, chemicals, plastics, and rubber materials. [Numerical interpretation is quarterly dollars x 1,000,000]
Manufacturing Imports (End)	CANSIM Table 228-0002	Section 5 inedible end products. Includes several groups such as engines, drilling and mining equipment, industrial machinery, apparel, and motor vehicles. [Numerical interpretation is quarterly dollars x 1,000,000]
Wage (Hourly Compensation for all jobs)	CANSIM Table 383-0008	The ratio between total compensation for all jobs, and the number of hours worked. The term "hourly compensation" is often used to refer to the total compensation per hour worked. [Index, 2007=100].
Labour Productivity	CANSIM Table 383-0008	A measure of real gross domestic product per hour worked [2007=100].
Recession (Dummy Variable)	See Definition	A recession is defined as two consecutive periods of negative real GDP growth. [Numerical interpretation is 1 if recession, 0 otherwise].
Expansion (Dummy Variable)	See Definition	An expansion is defined as the portion of the business cycle between post-recession recovery and the next business cycle peak. [Numerical interpretation is 1 if expansion, 0 otherwise].
Manufacturing TFP	CANSIM Table 383-0022	Manufacturing total factor productivity based on gross output measures the efficiency with which all inputs including capital, labour and intermediate inputs are used in production. It is the ratio of real gross output to combined units of all inputs (NAICS 31-33) [Numerical interpretation is index, with base year of 2002=100].
Mining Output	CANSIM Table 383-0022	Mining output is comprised of the proportion of gross domestic product at basic prices produced by the natural resources sector (NAICS 21). [Numerical interpretation is dollars x 1,000,000]
Cost of Capital	CANSIM Table 383-0022	The opportunity cost of the funds employed as the result of an investment decision; the rate of return that a business could earn if it chose another investment with equivalent risk. [Numerical interpretation is dollars x 1,000,000].

Capital-Labour Ratio	CANSIM Table 383-0022	Ratio of capital inputs to labour inputs. [Numerical interpretation is capital/labour].
Time (Data Set #2)	N/A	Yearly data from 1977 to 2008.

The Impact of Conditional Cash Transfer Programs on Entrepreneurship

James Balsillie

Introduction

Developing countries have recently been implementing targeted transfer programs at a remarkable rate. Policymakers have cited reduced inequality, increased welfare of lower classes, and breaking poverty as potential benefits of adopting such transfer programs.

In particular, conditional cash transfer (CCT) programs have become increasingly prevalent, as the number of countries with a CCT program has dramatically risen from three to twenty-nine between 1997 and 2008 (Fiszbein et al., 2009). A conditional cash transfer is a government-administered policy that provides either monetary compensation or compensation in the form of an alternative good, such as food, to citizens that participate in a specific social program, such as schooling or health care. In addition to poverty and inequality reduction, objectives of CCT programs include improved health, increased education, and reduced child labour.

Conditional cash transfer programs originated in Latin America with Mexico's Progresa, which was later renamed Oportunidades, and Brazil's Bolsa-Escola, which later merged into Bolsa-Familia (Handa and Davis, 2006). The effectiveness of these programs in reducing poverty and inequality as well as increasing participation in social programs has led to the massive expansion of CCT programs across the developing world. The expense of conditional cash transfer programs for governments tends to be less than or equal to 0.5 percent of GDP, and poverty headcount has been reduced by up to 50 percent in some countries (Barros et al., 2008). Also, research has shown significant improvements in caloric intake, education attainment, and health care participation in many programs (Hoddinott and Skoufias, 2004), (Behrman et al., 2010).

In addition to the explicit objectives of CCT programs, many unintended outcomes materialize as a result of these policies. Examples of these recognized indirect impacts include spillover effects on non-participants, changes in migration, and differences in saving (Stecklov et al., 2006). Understanding these changes brought about by conditional cash transfers is important for evaluating the effectiveness of policies and developing future programs.

The consequence of CCT programs on entrepreneurship is one of such indirect effects that must be understood. Entrepreneurship is widely regarded as a driver of economic progress, and is a key factor for development of impoverished countries. Joseph Schumpeter (1911) first demonstrated the theoretical link between entrepreneurship and growth, claiming that more entrepreneurs lead to greater growth. Wennekers and Thurik (1999) argue that the importance of entrepreneurship is in generating a vibrant sector of small-medium sized enterprises. The authors support this claim with empirical evidence

from developed economies. Recently, the relationship between entrepreneurship, competitiveness, innovation, and growth has been extended to developing countries (Hausmann and Rodrik, 2003), (Porter et al., 2002), (Naude, 2010).

Conditional cash transfers have multiple theoretical mechanisms that could influence nascent entrepreneurial activity, which would in turn impact the rate of entrepreneurship in a country. A cash transfer could provide the liquidity needed to make capital investments in a business. Alternatively, future cash transfers may provide stable income to enable risky entrepreneurial activity. Either of these effects may arise from additional income provided by conditional cash transfers. If these effects are significant and substantial, the return on conditional cash transfers is greater than previously thought. Also, a positive impact on entrepreneurial activity would help dispel a critique of CCT programs; that they only provide short-term poverty relief through increased consumption.

This paper will analyze Mexico's Progresa (Oportunidades) and Brazil's Bolsa-Família, the world's two largest conditional cash transfer programs in terms of both participants and amount of value transferred, to understand the influence of CCT policies on entrepreneurship (Handa and Davis, 2006). The two programs share similar design, with cash being used to compensate families for school and health clinic attendance. Data on each of these papers will be presented, analyzed, and compared to reveal the total impact of conditional cash transfers on entrepreneurship, as well as to understand the mechanism by which the effect is driven. These mechanisms will be compared with the results of other policies and experiments from around the developing world.

This essay finds that the two CCT policies studied do have a positive impact on entrepreneurship. This result is primarily caused by the insurance provided by the stable transfer income. When compared with analogous isolated experiments, these mechanisms do not behave consistently. These results are discussed, and policy design implications are made.

Entrepreneurship's Impact on Development

Early neoclassical theory of development economics prescribed technological adaptation, good institutions, and capital accumulation to aid the convergence of underdeveloped countries. This view has since been expanded upon to include elements of endogenous growth theory. Hausmann and Rodrik (2003) draw attention to facts that refute the basic neoclassical growth model. Their research compares the economic progress during the 1980's and 1990's of Asian countries including China, India, South Korea, and Taiwan with Latin American countries in relation to government policy.

The authors find that Latin American countries adopted many reductionist policies and greatly improved key institutions, but regressed in terms of GDP per capita as a percentage of USA GDP per capita from 22.9 percent in 1985 to 17.7 percent in 1999 (Hausmann and Rodrik, 2003). Meanwhile, policies in the Asian countries included more protectionist policies with more active industrial policy, but these were some of the

fastest growing economies during this period. Given that many other economies with protectionist policies fared quite poorly during this period, Hausmann and Rodrik claim that there must be a significant missing aspect of the neoclassical growth model.

The proposed missing aspect is “learning what one is good at producing”, which is achieved by entrepreneurs through trial and error (Hausmann and Rodrik, 2003). The authors suggest that this aspect is often undersupplied in developing economies, and that governments should use policy to increase supply to the socially optimal quantity. It is also stated that institutions to discipline inefficient firms are necessary. Hausmann and Rodrik point to the interventionist policies used by Asian countries as drivers to discover their current competitive advantages. Using this analytical framework for development, policies that encourage entrepreneurial activity are deemed beneficial to economic development.

The view that entrepreneurship is a driver of economic development is not held unanimously, and many opposing theories exist. Naude (2011) questions the empirical link between entrepreneurship and development, concluding that entrepreneurial activity is not a constraint to development. Boettke and Coyne (2003) maintain that institutions are the more fundamental to development, and entrepreneurship is a result of growth rather than a cause of it.

Whether or not the rate of entrepreneurship impacts a country’s growth path is uncertain, though recent literature generally supports a positive causal link between entrepreneurial activity and development (Goedhuys et al., 2011). Regardless of the general effects, self-employment provides income for marginalized citizens, leads to higher savings, and increases socioeconomic mobility (Quadrini, 2000).

Constraints to Entrepreneurship

There exist many possible constraints that limit entrepreneurial activity in developing countries. Two of the most binding potential constraints are a liquidity constraint and an insurance constraint. The prevalence of either of these restrictions in a region can result in the number of entrepreneurs sitting below the socially optimal amount for the economy.

Liquidity constraint refers to a lack of access to financial support that prevents business investment by an entrepreneur. In theory, investment would only be made when capital is expected to have positive returns, so the inability to make said investment would limit the output of the individual and thus limit economic activity as a whole. Liquidity constraints are prevalent across the developing world, as evidenced by survey results from Sri Lanka and Tanzania in which access to finance was the leading constraint reported by Small and Medium-Sized Enterprises (SMEs) (Levy, 1993). Extensive literature reports the necessity of access to finance for economic development to relieve the liquidity constraint (Karlan and Morduch, 2009), (Levine 2005).

An insurance constraint pertains to the avoidance of risky incomes from entrepreneurship due to risk-averse household consumption preferences. Entrepreneurial returns are more volatile than wage income and, given that many developing country households are especially sensitive to income shocks due to their poverty level, households cannot afford to engage in the risk associated with entrepreneurship (Kihlstrom and Laffont, 1979). That is, even if the expected return from entrepreneurship is greater than the expected return from working, the expected utility from entrepreneurship may be less than that obtained from working due to risk aversion and diminishing returns to consumption.

Conditional cash transfers may have the potential to help entrepreneurs overcome either of these constraints. Accumulation of past and current transfers could enable necessary household saving. This would provide potential entrepreneurs with the cash to invest in operational capital for launching a business. Also, if the transfers are stable, predictable, and provided for a prolonged period of time, they may act as insurance against income drops, capacitating households to pursue riskier entrepreneurial activity rather than wage income. Households are expected to be more responsive to past and current transfers if the liquidity constraint is more binding, and are expected to be more responsive to expected future transfers if the insurance constraint is more binding.

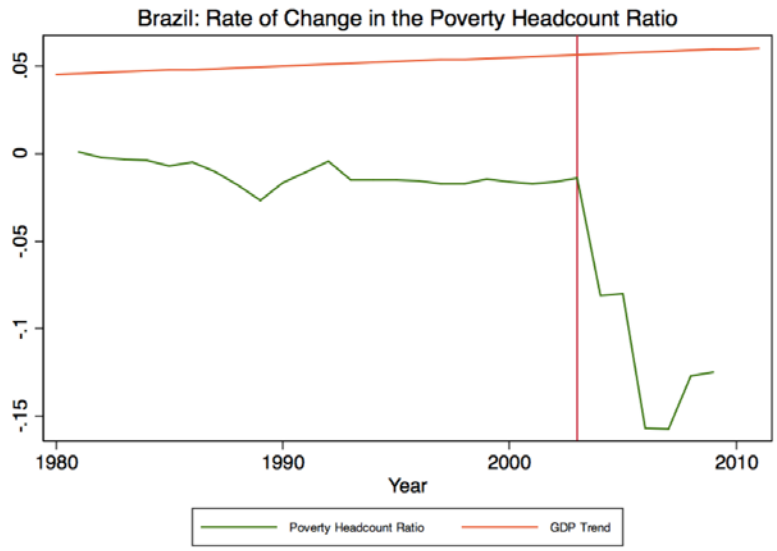
Bolsa-Familia as an Experiment

Bolsa-Familia, formerly Bolsa-Escola, is a conditional cash transfer program that has been operational in Brazil since 2003. The aim of the program is to alleviate poverty in the short-term by transferring cash to extremely poor families and pregnant women. Receiving benefits from Bolsa-Familia is contingent on various activities including school enrolment of children, attending health clinics, and keeping vaccination records. Increased participation in these activities is proposed to accelerate the country's development through improved health and increased human capital.

Monthly transfers are valued between $40 and $80 (2010 USD), dependent on the number of children enrolled in programs (Lichand, 2010). Given that the eligible income bracket is under $85 of monthly household earnings, these transfers increase total income by an average of nearly 50 percent (Lichand, 2010). Bolsa-Familia has led to substantial poverty reduction, with many marginalized citizens raised above the poverty line since the introduction of the program. Barros et al., (2007) report a recent 50 percent fall in inequality in Brazil, largely due to Bolsa-Familia. Figure 1 shows the annual rate of change of poverty headcount. The vertical line in 2003 represents the implementation of Brazil's CCT program.

Guilherme Lichand (2010) studied the effects of Bolsa-Familia on entrepreneurship, using household data from 2004 and 2006, by analyzing if receiving the transfer changed the probability of becoming self-employed. The paper attempts to segregate the effects of relieving a liquidity constraint and of providing insurance among recipient households on occupational choice. Self-employment in this article includes part-time activity as well as full time.

Figure 1



(Ávila, 2010, p. 48)

To assess the program's impact on the liquidity constraint, households with equal wealth prior to the administration of transfers are compared. Wealth is proxied with asset ownership in this case. Thus, comparative households have equal capacity to pay and equal borrowing capacity to make investments prior to the transfer. After the transfer is made, recipients (treatment group) should have a greater probability of ability to afford start-up costs than non-recipients (control group). If the treatment group shows a higher rate of entry into entrepreneurship than the control group after the transfer, one can conclude with a high degree of confidence that households were previously liquidity constrained.

After controlling for observable characteristics, the paper finds that the specified treatment group has a 1.76 percent greater probability of starting a new venture than those in the control group (Lichand, 2010). This effect is only found to be significant in increasing self-employment part time, as supplementary income to a wage-paying job. Thus, the liquidity constraint is partially alleviated to enable part-time entrepreneurship, but possibly not enough to invest in a full-time venture. The difference in firm start-up is entirely from services business, which has higher investment costs than commerce does.

To understand the importance of alleviation of the insurance constraint, households with equal income after the transfer has been administered are compared. Again, the treatment group consists of transfer recipients while the control group consist of non-recipients. Given equal income, these groups should have equal ability to pay for start-up costs, but they differ in that the treatment group's share of income from stable sources is greater than the control's because of the transfer. If the treatment group is more likely to become self-employed than the control group, it will be attributed to a relaxed insurance constraint from the addition of stable income from the CCT.

In comparing the treatment and control groups for measuring the effect of the insurance constraint, Lichand (2010) finds the treatment group to have a 1.73 percent greater probability of starting a business due to relief of the insurance constraint. Again, this effect is only found significant for the creation of part-time businesses.

Brazil's Bolsa-Familia program is shown to have a small, but statistically significant, positive impact on the rate of venture creation among transfer recipients. Both the liquidity and insurance constraints are partially relieved, resulting in the increase in entrepreneurship. The entirety of the significance of this effect is due to an increase in part-time employment, possibly indicating that the constraints still prevent movement to full-time entrepreneurship. The effects are not completely conclusive, and only household-level panel data would show the full impact of Bolsa-Familia on entrepreneurship.

Progresa (Oportunidades) as an Experiment

Progresa, later renamed "Oportunidades", was a program implemented by the Mexican government in 1997 to break the poverty trap that existed in impoverished communities across the country (Gertler et al., 2006). Progresa (Oportunidades) sought to address Mexico's poverty problem through a conditional cash transfer program, the first large scale program in the world of its kind. Like Bolsa-Familia in Brazil, families in impoverished regions were offered bi-monthly payments to compensate for enrolling their children in school, receiving preventative health care, and attending educational health talks (ORTO, 2012).

Food stipends were distributed for participating in health programs, and cash transfers given for school attendance. Transfers increased in size with the number of children enrolled, and with the age of the children. The median value of benefits in 1998 was approximately $18 (converted USD) per month, making up an average of 28 percent of income for participants (Bianchi and Bobba, 2010).

Bianchi and Bobba (2010), and Gertler et al. (2006) provide analysis of Progresa's (Oportunidades') impact on entrepreneurship. Both papers study household level data from the late 1990's, when Progresa was still expanding across rural regions. At the time that this data was collected, Progresa had been implemented in 320 out of 506 eligible communities. The selection of the treatment regions was random, so a control group of 186 communities emerged. Both studies took advantage of this natural experiment, comparing treatment and control regions.

Gertler, et al. (2006) compare the gross probability of engaging in entrepreneurship of participant households in treatment communities with would-be eligible households in control regions. The study finds that treatment households are approximately 45 percent more likely than controls to be entrepreneurs, including part time. There is, however, no measure of the probability to become an entrepreneur, only the total entrepreneurial rate. Also, differentiation between liquidity and insurance constraint relief is not achieved. Thus, the study gives the qualitative result that Progresa positively impacts the rate of

entrepreneurship, but no quantitative answer is given for what drives this increased level, or how the policy influences business start-up.

Bianchi and Bobba (2010) analyze the influence of Progresa on the rate of entry into entrepreneurship rather than the total rate of entrepreneurial activity. The study finds that treatment households are approximately 20 percent more likely to enter self-employment than those in control communities. This is possibly consistent with the aforementioned figure from Gertler et al. (2006), measuring the total entrepreneurial rate. This is because entry into self-employment is cumulative over periods, so difference in total rate of entrepreneurship will reflect the compounding of differences of entry rate.

Bianchi and Bobba (2010) seek to expand on the understanding created by Gertler et al. (2006) by attempting to isolate mechanisms that cause the higher rate of entrepreneurship found in treatment communities over controls. To understand the influence of the conditional cash transfer in alleviating the liquidity constraint, the paper relates the amount of transfers received over the past six months to the rate of entry into entrepreneurship. If the households were liquidity constrained, it is expected that past cash transfers would provide the needed capital to pay start-up costs. Thus, if the rate of entry into entrepreneurship is positively responsive to past transfers, the result will be interpreted that the households were indeed liquidity constrained, and that Progresa relieved this constraint.

After controlling for observable variables, it is found that transfers received over the past six months did not significantly impact the probability of becoming self-employed. The authors interpret this result as an indication that households were not liquidity constrained since the cash provided by past transfers did not enable entrepreneurship.

The impact of expected future transfers on the rate of entry to entrepreneurship is claimed to be an indication of the presence of an insurance constraint. Transfers from Progesa acted as a stable source of income, available for a known amount of years to participating households. If households were insurance constrained, stable income from future transfers would enable self-employment because of decreased relative risk (Kihlstrom and Laffont, 1979).

Expected future transfers is measured by the value of transfers that a household would earn over the next six months, assuming enrolment decisions remain unchanged and taking into account increased transfer amounts from grade progression. Bianchi and Bobba (2010) find that the probability of becoming self-employed is significantly dependent on the size of expected future transfers. Quantitatively, a one standard deviation increase in the amount of expected transfers over the next six months causes a 12 percent increase in average probability of entry into entrepreneurship. A similar result for expected transfers over the next twelve months reinforces this result, indicating that households were insurance constrained. Bianchi and Bobba (2010) conclude that the substantial increase in entrepreneurship caused by Progresa could be entirely attributed to alleviation of the insurance constraint.

A competing theory for the increased rate of entry into entrepreneurship among Progresa beneficiaries is that the increase was a result of greater demand in treatment areas due to the influx of wealth. Comparing the rate of entry into self-employment for non-eligible households in treatment communities with would-be non-eligible households in controls, tests this. Bianchi and Bobba (2010) find that there is no difference in means for rate of entry into entrepreneurship between these groups, so this theory is not accepted.

Experiments of Liquidity and Insurance Constraints

While both an insurance constraint and a liquidity constraint are theoretically feasible, their applicable validity cannot be taken for granted. Experiments, both natural and administered, can unveil basic preferences to better understand the relevance of these two constraints. The three examples given below show that liquidity and insurance constraints are prevalent in developing countries, but also illuminate that different exogenous factors lead to varied constraints across nations.

De Mel, McKenzie, and Woodruff (2008) conducted a field experiment to test the liquidity constraint of microenterprises in Sri Lanka. Grants of $100 to $200 were given to businesses with less than $1000 of operative capital. Returns to capital from the grants were above 50 percent annually. The high returns were evidence that these businesses were operating far below optimal levels of capital. Since the investment was made only upon receiving a grant, and the investment moved businesses towards optimal production, the paper concludes that the entrepreneurs must have been capital constrained.

Dercon and Christiaensen (2011) study the use of fertilizer by farmers in Ethiopia to uncover the impact of an insurance constraint on behavior. Fertilizer is a high cost annual investment for Ethiopian farmers relative to their income, but it generates a positive average return on investment. When weather is bad, however, the sunk cost of fertilizer will cause negative returns on investment. Since many farmers are near subsistence level, the downside of negative returns causes strong risk-averse preferences, leading to low adoption rates of fertilizer. If protection against the downside was available, the paper predicts that adoption rates would be far higher. Thus, Dercon and Christiaensen suggest that farmers face an insurance constraint, preventing optimal production levels.

Macours, Premand, and Vakis (2012) analyze a control trial in Nicaragua, which provided interventions aimed at increasing households' resilience to income shocks due to drought. The study found that households that received an investment grant of $200 (USD) fared better than the controls during droughts. Recipients of the grant were more likely than controls to create a part-time non-agricultural business to diversify income, leading to higher income and consumption during drought shocks. This paper reveals a potential mechanism not previously discussed; relief of a liquidity constraint as a means to provide insurance.

Comparative Discussion of Bolsa-Familia and Progresa

The stark difference between results of Bolsa-Familia's and Progresa's impact on entrepreneurship is the effect of the liquidity constraint. Lichand (2010) finds that alleviation of the liquidity constraint is equally important as relief of the insurance constraint in Brazil, but Bianchi and Bobba (2010) show that the liquidity constraint was not at all binding in Mexico. Empirical work by the two papers used different measures for relief of a liquidity constraint, which may partially account for the difference. The measures are, however, quite similar as both cases compare the influence of an increase of wealth from the CCT on entrepreneurial activity. McKenzie and Woodruff (2006) also fail to find conclusive evidence of a liquidity constraint among Mexican microenterprises, while Gomes and Paz (2010) find support for liquidity constraints in Brazil. Thus, it is probable that the understanding of constraints in Mexico and Brazil are accurate.

An alternative explanation for the different effect of each program on entrepreneurship is that the two countries are simply constrained by different factors. An example of this is the difference between Brazil and Mexico in alleviation of the liquidity constraint through microfinance. Data from the mid-2000's shows that the rate of microfinance usage in Mexico is four times that in Brazil (Rhyne and Otero, 2006). There is a general lack of certainty for why there exists a difference in liquidity constraints, and current research has yet to explain this comparative difference.

Lichand (2010) uncovers that new entrepreneurial activity brought about by Bolsa-Familia was entirely attributable to an increase in part-time self-employment. Bianchi and Bobba (2010) find a similar figure: new entrepreneurs are more than four times as likely to hold multiple paid occupations as wage workers. As evident in the example of farmers in Nicaragua, complementary employment is a method common in developing countries to smooth income (Banerjee and Duflo, 2008). This shared trait between Brazil and Mexico indicates that significant insurance constraints remain despite the cash transfers.

Policy Implications

Evidence from Mexico's conditional cash transfer program, Progresa, and Brazil's, Bolsa-Familia, show that transfers do indeed have a positive influence on the rate of new self-employment. Recent development economics literature tends to agree that increasing the rate of entrepreneurship increases growth and improves the maturation of a country. Positive short-term effects are found in Mexico, with higher labour earnings and food consumption among new entrepreneurs than comparison groups (Banerjee and Duflo, 2008). Additionally, long-term benefits of increased competition and comparative advantage discovery may result (Hausmann and Rodrik, 2003).

The core motivations behind conditional cash transfers are, however, to alleviate poverty, and to increase participation in social programs such as education and health care. Though these programs have a positive impact on the rate of entrepreneurship, this effect is small, possibly negligible, in comparison to the impact on main issues.

With consideration of the influence on entrepreneurship, conditional cash transfer programs have a larger economic impact, especially in the long term, than previously evaluated. Given this increased return, transfer size should be slightly increased in terms of number of recipients or amount of money per recipient to reach the optimal level. Determining the magnitude of this increase would require further research and calculation. It is expected that this increase would be very small since the influence on entrepreneurial activity is only a side effect of CCTs, as opposed to a main goal.

Should increasing entrepreneurial activity be identified as a desirable outcome by developing country governments, there exist more efficient policies for relieving liquidity and insurance constraints. Microfinance has demonstrated the potential to provide short-term working capital needed for entrepreneurs in developing countries to fund their businesses, alleviating the liquidity constraint. Welfare provision or public insurance, such as weather insurance, can relax the income constraint. These policies are much more direct in fostering new entrepreneurial activity, and can be implemented alongside CCT programs since the transfers do not entirely alleviate entrepreneurial constraints.

Conclusion

Households in developing countries face liquidity and insurance constraints to various degrees. Conditional cash transfer programs have the ability to alleviate the liquidity constraint through past and current transfers, and the insurance constraint with certain future transfers.

The two largest CCT programs, Bolsa-Familia in Brazil and Progresa (Oportunidades) in Mexico, have been studied to reveal their impact on entrepreneurial constraints. These studies found evidence that entrepreneurial activity was increased in both countries by the programs. Both liquidity and insurance constraints were partially relieved in Brazil, while just the insurance constraint was relaxed in Mexico.

These effects are not core to the objectives of conditional cash transfers. The impact on self-employment is significant, however, so it must be taken into account when designing CCT policy. Future research should aim to further isolate the insurance and liquidity constraints to better understand how to encourage entrepreneurship in developing countries. Also, benefit analysis of effects on entrepreneurship should be conducted to inform the optimal size of conditional cash transfer programs.

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