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The Effects of Real Exchange Rate Fluctuations on the Gender Wage Gap and Domestic Violence in Uruguay

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Abstract^{*}

In this paper, we bring to light the experiences resulting from the significant depreciation of the Uruguayan real exchange rate between 2002 and 2003, followed by an equally considerable appreciation between 2004 and 2010. We explore the link between these fluctuations and the incidence of domestic violence taking place in Uruguay. The real exchange rate is a measure of the relative price between tradable and nontradable goods. While men are traditionally employed in tradable industries, such as manufacturing, women are more likely to work in nontradable industries, such as the service sector. A change in the real exchange rate, therefore, can affect the potential wages of men differently from those of women. In line with the models that represent household bargaining, an increase in the real exchange rate can generate an increase in the bargaining power of men relative to that of women within the household. We present evidence that it raises the frequency of domestic violence. This holds true in rich and poor areas of the city.

JEL Code: K42

Keywords: Real exchange rate, gender wage gap, domestic violence, assault

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1. Introduction

Domestic violence is a common and widespread issue. Out of every three women in the world, one has suffered violence from a partner at some time in her life (WHO, 2013). The incidence is more frequent in developing countries. A report, based on data from the Demographic and Health Surveys in nine developing countries (Cambodia, Colombia, Dominican Republic, Egypt, Haiti, India, Nicaragua, Peru, and Zambia), indicates that the percentage of women who have experienced violence from an intimate partner ranged between 18 percent in Cambodia and 48 percent in Zambia (Kishor and Johnson, 2004).

In this paper, we explore the causes of domestic violence, using data from Uruguay. A recent survey from Uruguay's Ministry of Public Health reveals that one out of four women falls victim to domestic violence. The survey also indicates that the incidence of domestic violence is higher for those women with low educational attainment.

In this study, we identify the effects of Uruguay's major depreciation of the real exchange rate between 2002 and 2003.¹ We include an examination of the consequences of an equally significant appreciation of the real exchange rate between 2004 and 2010. As this is a measure of the relative price between tradable and nontradable goods, the fact that men are traditionally employed in tradable industries (e.g., manufacturing) and women in nontradable industries (e.g., services) will be taken into account.

We examine the exogenous variations in the gender wage gap due to these fluctuations to estimate the impact that better alternative options may have on women with regard to domestic violence. By using the variables in the proportion of women vis-à-vis men in the tradable and nontradable sectors across the jurisdictions of Montevideo, Uruguay's capital (with a population of 1.5 million), we find that reduction in potential wages for women relative to men leads to increased incidences of domestic violence. This result holds true in not only the poor jurisdictions of Montevideo, but also in the rich areas.

There are two alternative theories on which the debate continues and to which this study contributes. On the one hand, socio-cultural models predict that violence against

¹ Due to the lack of international reserves to sustain the value of the currency in July 2002, the Central Bank of Uruguay was forced to suddenly interrupt the fixed exchange rate regime (crawling peg).

women increases as their wages increase, mainly because men perceive that their traditional gender role is threatened: “when she brings home the bacon” (Macmillan and Gartner, 1999). On the other hand, models of household bargaining estimate that an increase in a woman’s relative potential wage will raise her bargaining power by providing her with better options (Farmer and Tiefenthaler, 1997; Aizer, 2010). Given that it is not the actual wage but rather the potential wage that determines another alternative, improving the relative labor market conditions for women will help to decrease such violence, especially in those households where the woman does not work outside the home (Pollak, 2005). The opposite holds true; that is, the deterioration in women’s potential wages relative to men’s will increase domestic violence.

Most empirical studies (Gelles, 1976; Tauchen, Witte, and Long, 1991; Farmer and Tiefenthaler, 1997; Bowlus and Seitz, 2006;) have methodological shortcomings. They either have problems with omitted variables associated with women’s wages (e.g., education), explaining the negative relationship with violence, or have problems with the reverse causality given by the fact that domestic violence may reduce woman’s productivity and earnings.

A notable exception is Aizer (2010) who presents a household bargaining model that incorporates violence and analyzes the impact of the gender wage gap as a function of local demand for female and male labor. She provides empirical support, in the case of the United States, for a causal relationship between relative labor market conditions for women and female hospitalization as a result of assault. Her main finding has been that a decrease in the wage gap between men and women can reduce violence against women. This study expands upon these results by considering not only the serious physical but also the nonphysical abuse against women. In fact, according to a recent survey by the National Bureau of Statistics (INE, 2013), a third of the females who were victims of domestic violence also had suffered from physical force and two thirds had experienced psychological aggression.² The findings presented in this paper, within the wider definition of domestic violence, are consistent with the household bargaining model.

² Among those victims of physical domestic violence, nearly half experience sexual aggression.

2. Empirical Strategy

Our estimates of domestic violence in Uruguay represent a period when the potential gender wage gap suffered as a result of significant exchange rate variations. Specifically, these variations—as a measure of the relative price between tradable goods (male-work intensive) and nontradable goods (female-work intensive)—will be examined. This approach accounts for the theory that potential wages—not actual—contribute to domestic violence.

Uruguayan Law defines domestic violence in a similar way to that of the U.S. Department of Justice. This paper, therefore, will consider domestic violence as a pattern of abusive behavior in a relationship, used by one partner to gain or maintain power and control over another. Domestic violence can be physical, sexual, emotional, economic, or psychological, in action and in threat, borne by a partner in the home.

There are various definitions of real exchange rate in the literature (Hinkle and Montiel, 1999). First, real exchange rate can be defined as the relationship between domestic and external prices (trade-weighted multilateral), expressed in the same currency ($RXR_1 = (E \cdot P^*)/P$, where E is the nominal exchange rate measured in domestic currency per foreign currency; P^* is the level of external prices; and P is the level of domestic prices). More importantly—for the purpose of this paper—real exchange rate can also be equivalent to a price ratio of different categories of goods within the domestic economy: tradable goods and services and nontradable goods and services. Tradable goods and services are subject to international trade, in which case arbitrage can determine whether or not the domestic price is equal to the international price. This does not hold true for nontradable goods and services, however, where the price must be adjusted to close the excess of demand or supply in the domestic market. The real exchange rate, therefore, is alternatively defined as follows: $RXR_2 = P_T/P_N$, where P_T refers to the tradable price and P_N for the nontradable price. It is straightforward to show that both definitions, RXR_1 and RXR_2 , are closely related.³ Therefore, changes in the multilateral trade-weighted real exchange rate come hand in hand with changes in the relative prices of tradable and nontradable goods.

Data from Uruguay's National Household Survey confirms that men's wages, relative to women's, move with the real exchange rate. In fact, between 2002 and 2004,

³ $RXR_1 = (E \cdot P^*)/P = (E \cdot P^*)/(PT^\alpha \cdot PN^{(1-\alpha)}) = E \cdot P^*/(PT) [PT/PN]^{(1-\alpha)} = D \cdot RER_2^{(1-\alpha)}$ where P is a geometric price average, D is the tradable goods price deviation with respect to the external prices expressed in the same currency, and α is the share of the tradable goods in the domestic prices basket.

after a significant real exchange rate depreciation, the ratio of men's wages to women's in Montevideo increased from 1.52 to 1.58; and between 2004 and 2010, following a real exchange rate appreciation (similar in absolute values to the previous depreciation), the wage ratio dropped back to 1.52.

Figure 1, in which data derives from the Ministry of the Interior and the Central Bank of Uruguay, presents a striking pattern of the time series of domestic violence and the trade-weighted multilateral real exchange rate in the period January 2002 to December 2010. Between May 2002 and January 2004, the trade-weighted multilateral real exchange rate depreciated by 58 percent while, at the same time, domestic violence increased by 154 percent. That is, in this period violence against women in Uruguay increased as their potential relative earnings decreased. Interestingly, the reverse is also true: between January 2004 and February 2009, the trade-weighted multilateral real exchange rate appreciated by 29 percent while, at the same time, domestic violence decreased by 61 percent.

In this same time frame, the behavior of a similar type of crime, assault (abusive behavior against another person that excludes domestic violence), differed to that observed in domestic violence.⁴ Assaults increased by 40 percent between May 2002 and January 2004 and by 6 percent between January 2004 and February 2009.

A basic regression analysis on monthly data (not reported) from January 2002 to December 2010 confirms these results.⁵ The coefficient of regressing domestic violence on the real exchange rate is positive and statistically significant at the 10-percent level. The coefficient is not statistically significant when assaults are considered in place of domestic violence.

An analysis of this observed pattern was made by accessing the database of the Police Department of Montevideo (responsible for 24 police jurisdictions), which includes offenses that have been reported between 2002 and 2010.⁶ The data include the date of incidence and the jurisdiction where it occurred.

Additionally, we gathered data from the National Household Survey, managed by the National Bureau of Statistics on an annual basis, in order to compute the labor participation of men and women in tradable and nontradable industries. Initially, we

⁴ Data include 19,276 cases in Montevideo of domestic violence (2 percent of total crime between 2002 and 2010) and 38,657 cases of assault (5 percent of total crime between 2002 and 2010).

⁵ The Augmented Dickey-Fuller Test (MacKinnon, 1996) rejects the null hypothesis that the time series on domestic violence and assault have a unit root. To deal with potential heteroskedasticity and serial correlation, Newey-West robust standard errors are computed with a lag truncation of four months. All results mentioned, but not shown, are available from the authors upon request.

⁶ There is no regular survey available on domestic violence victimization.

established that the share of women in the population is very similar across jurisdictions and years. We found that the average share of women was 54 percent, ranging from a maximum of 57 percent to a minimum of 48 percent. Industries were sorted as tradable or nontradable. We applied the International Standard Industrial Classification (Rev.3) to define (i) agriculture, hunting, and forestry, b) fishing, (ii) mining and quarrying, and (iii) manufacturing as tradable industries. The remaining industries were considered as nontradable. This classification is in line with Stockman and Tesar (1995) and Aboal, Lorenzo, and Osimani (2005). Table 2 shows the share of employed agents who worked in tradable sectors in each police jurisdiction from 2002 to 2010. As illustrated, there is an important variability over time and across jurisdiction, establishing that tradable industries are more intensive in male human capital than in female human capital. For every year since 2002 to 2010, the average share of men working in tradable sectors has been higher than that of women. If we take the total sample period into consideration, 20 percent of men were employed in tradable sectors compared to 14 percent of women. The differentials in the employment rate in tradable sectors between men and women are statistically significant according to the usual t-tests applied for each year and in the total sample period.

To identify the effect of a potential gender wage gap on domestic violence, we apply the variability in the relative proportion of men to women working in the tradable sector in each police jurisdiction. We assumed that those people who are unemployed (including those who have opted not to work) have the same distribution of tradable and nontradable skills as those who are employed. As a result, the potential impact of better options in the job market on unemployed people is recognized.

Figure 2 introduces our identification strategy. The 24 police jurisdictions were divided into two groups, with the first comprising those jurisdictions where the ratio of men to female participation in tradable sectors is higher than 1.5 and the second comprising those where the ratio is less than 1.5. Subsequently, we tracked the variation in domestic violence in both groups in time frames that were defined by the fluctuations in the real exchange rate. Prior to the real exchange rate depreciation (January 2002 to May 2002), when the real exchange rate was flat, a small reduction in domestic violence in both groups of jurisdiction occurred. As long as the real exchange rate had depreciated (May 2002 to January 2004), however, it was found that domestic violence increased significantly in those jurisdictions where the ratio of men to female participation in tradable sectors was more intensive. In other words, the higher the

participation rate of men relative to women in tradable sectors, the stronger the impact on the incidence of domestic violence. Similarly, when the real exchange rate appreciated (January 2004 to February 2009), the decrease in domestic violence was higher in those jurisdictions where the ratio of men to female participation in tradable sectors is higher.

In order to identify the causal effect, a difference-in-difference methodology was followed, controlling for observable and unobservable characteristics that remain constant in time, as well as for shocks that are common in all jurisdictions. For this, the following equation was run:

$$Y_{it} = \beta D_i RXR_t + \mu_t + \delta_i + e_{it} \quad (1)$$

where Y_{it} is domestic violence in jurisdiction i and month t , D_i is the relative proportion of employed men to employed women in tradable sectors in jurisdiction i in 2002 (the first year of the sample period),⁷ RXR_t is the multilateral exchange rate, μ_t is a month fixed effect, δ_i is a jurisdiction fixed effect, and e_{it} is the usual error term. In this equation, the parameter of interest is β .

The hypothesis is that an increase in the exchange rate should have a stronger effect on domestic violence in those jurisdictions where the relative proportion of men to women in tradable sectors is higher. That is, we expect $\beta > 0$.

3. Results

Table 3 represents the estimates of Equation (1). In line with the hypothesis, the coefficient on the interaction term is positive and statistically significant, even after considering standard errors clustered at the jurisdiction level (column (1)). That is, an increase in the exchange rate has a stronger effect on domestic violence in those jurisdictions where the relative proportion of men to women in tradable sectors is higher. Indeed, the coefficient is not only statistically significant; it is also quantitatively substantial. An increase of one standard deviation in the real exchange rate is associated with an increase of 2.7 cases of domestic violence (evaluated at the sample mean of the ratio of men to female participation in the tradable sectors). This increase in the number of cases of domestic violence is important, since it represents more than a

⁷ The same data is considered for the period 2003-10 with no significant differences. In each police jurisdiction, the values of the coefficient of variation (the ratio of the standard deviation to the mean) across time from 2002 to 2010 of the share of men and women working in tradable-sector industries are very stable.

third of the sample mean (7.39). Separate analyses were made of the impact on rich and poor jurisdictions of the city and similar results were evidenced (columns (2) and (3)).⁸

The results hold true subsequent to the controlling by the per capita income of the jurisdictions (column (4)). This discards alternative interpretations that connect the variation in domestic violence to fluctuations in the aggregate level of income of the household in place of the change in women's bargaining power.

The results also hold when we took into account the number of cases of domestic violence normalized by the population of the jurisdictions (column (5)). This also applies when we used annual data in lieu of monthly data, with and without controlling for the per capita income of jurisdictions (columns (6) and (7)).⁹

Additionally, we ran a false experiment with regard to the variation in assaults, a similar type of offense but occurring outside the home. That is, Equation (1) was applied, using assaults as an outcome rather than related to domestic violence. As shown in Table 4, the coefficient on the interaction term is not significant in all specifications (columns (1), (2), and (3)). These results provide additional evidence that the effect on domestic violence is, indeed, causal.

4. Conclusions

For this paper, we delved further into the economic causes of domestic violence, whereby the relationship between income and domestic violence is examined. We expanded the coverage of the definition of domestic violence (including any type of nonphysical abuse) in previous findings in the literature. We found that a reduction in women's potential wages, relative to men's, increased domestic violence, whereas an increase in women's relative potential wages decreased men's incentive towards aggression within the home. The result also holds for the rich and poor jurisdictions of the city, suggesting that the effect cuts across the various levels of income.

Our paper—as do most papers in this literature—uses data on reported crime instead of actual crime. In principle, it is possible that reporting is not orthogonal to the changes in the exchange rate, potentially biasing the estimates. This bias, however, could go in either direction. For example, the appreciation of the real exchange rate may

⁸ A rich jurisdiction is defined as one where the average per capita income is above the 66th percentile of the per capita income of the city in the first year of the sample. A poor jurisdiction is defined as one where the average per capita income is below the 33rd percentile of the per capita income of the city in the first year of the sample.

⁹ Results also hold when a regression model is used to count data (Poisson or negative binomial).

decrease the reporting if women feel responsible for the worsening of men's economic conditions. Alternatively, the availability of better options may increase the propensity of women to report domestic violence.

Our findings contribute to the ongoing global debate on the causal effect of the gender wage gap and domestic violence. Evidence is presented in line with the hypothesis that an increase in the bargaining power of women, relative to men, within the household reduces domestic violence. Therefore, government policies that aim to reduce the gender wage gap will impact positively on domestic violence. Simultaneously, these results suggest that the intensity of women-oriented policies should be calibrated according to the fluctuations in the real exchange rate. In fact, macro literature has long recognized the potential economic advantages of real exchange depreciations, produced by the competitive gains of exporters. Here, we unmask a potential social issue that is associated with real exchange depreciation—that of rising domestic violence.

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Table 1. Summary of Statistics

	Mean	St. dev.	Min.	Max.	Obs.
Domestic violence	7.394	6.514	0	44	2,592
Assaults	14.879	9.683	0	56	2,592
Per capita income	7,706	4,133	2,298	22,527	216
Ratio of men to female					
Participation in tradable sectors	2.081	0.564	1	2.4	24
Multilateral exchange rate	121.593	15.079	91	150	108

Table 2. Employment Rates in the Tradable Sectors

Jurisdiction	2002		2003		2004		2005		2006		2007		2008		2009		2010	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
1	13%	15%	7%	9%	10%	13%	12%	11%	11%	10%	15%	7%	18%	12%	9%	8%	11%	9%
2	16%	7%	9%	7%	13%	7%	12%	10%	12%	7%	17%	10%	13%	7%	11%	12%	12%	8%
3	12%	7%	14%	9%	15%	7%	14%	11%	14%	10%	14%	9%	13%	7%	13%	10%	12%	9%
4	14%	9%	12%	9%	15%	12%	17%	13%	15%	13%	18%	13%	15%	11%	12%	10%	14%	10%
5	14%	8%	12%	7%	13%	9%	15%	9%	13%	9%	15%	10%	12%	7%	14%	10%	12%	8%
6	19%	12%	16%	15%	18%	12%	16%	14%	19%	12%	18%	12%	19%	12%	17%	11%	18%	11%
7	17%	12%	21%	14%	18%	11%	17%	12%	20%	12%	18%	11%	21%	13%	17%	12%	21%	12%
8	20%	15%	19%	16%	21%	16%	21%	12%	21%	17%	21%	15%	25%	17%	22%	14%	22%	14%
9	14%	10%	14%	10%	12%	10%	15%	10%	14%	10%	15%	10%	14%	9%	12%	8%	12%	9%
10	18%	10%	12%	11%	15%	9%	14%	10%	13%	8%	16%	11%	13%	7%	12%	9%	13%	9%
11	15%	13%	15%	12%	15%	7%	16%	9%	15%	8%	14%	9%	16%	9%	16%	8%	14%	11%
12	16%	12%	17%	15%	21%	16%	14%	14%	17%	14%	16%	15%	15%	16%	19%	12%	18%	15%
13	15%	11%	15%	13%	19%	17%	15%	12%	17%	10%	19%	13%	18%	11%	18%	11%	16%	12%
14	15%	12%	17%	9%	20%	11%	18%	10%	18%	11%	17%	10%	17%	11%	17%	10%	18%	10%
15	18%	12%	16%	11%	13%	10%	12%	10%	15%	12%	16%	11%	14%	11%	13%	9%	15%	9%
16	19%	14%	19%	16%	19%	13%	22%	16%	21%	16%	21%	14%	20%	15%	21%	15%	20%	15%
17	19%	13%	25%	16%	20%	17%	25%	19%	20%	16%	23%	15%	25%	18%	25%	15%	22%	15%
18	18%	14%	23%	17%	22%	14%	23%	16%	23%	17%	21%	16%	24%	16%	23%	17%	22%	13%
19	24%	13%	23%	16%	27%	18%	20%	17%	24%	17%	24%	16%	24%	15%	26%	14%	23%	16%
20	25%	26%	32%	34%	39%	21%	33%	31%	32%	26%	34%	25%	36%	24%	39%	24%	37%	25%
21	24%	18%	29%	18%	26%	18%	27%	18%	25%	19%	27%	17%	28%	16%	26%	17%	23%	16%
22	35%	19%	31%	28%	48%	27%	38%	26%	33%	21%	41%	22%	40%	21%	35%	17%	33%	17%
23	22%	19%	33%	30%	32%	23%	26%	26%	27%	21%	27%	21%	30%	21%	31%	22%	29%	21%

24	19%	19%	26%	16%	21%	20%	20%	17%	25%	16%	23%	16%	24%	16%	24%	16%	23%	15%
Max.	35%	26%	33%	34%	48%	27%	38%	31%	33%	26%	41%	25%	40%	24%	39%	24%	37%	25%
Min.	12%	7%	7%	7%	10%	7%	12%	9%	11%	7%	14%	7%	12%	7%	9%	8%	11%	8%
Mean	18%	13%	19%	15%	20%	14%	19%	15%	19%	14%	20%	14%	21%	13%	20%	13%	19%	13%
St. Dev.	5%	4%	7%	7%	9%	5%	7%	6%	6%	5%	7%	4%	7%	5%	8%	4%	7%	4%
T-test	<i>p=0,000</i>		<i>p=0,025</i>		<i>p=0,002</i>		<i>p=0,009</i>		<i>p=0,000</i>		<i>p=0,000</i>		<i>p=0,000</i>		<i>p=0,000</i>		<i>p=0,000</i>	

Notes: t-test refers to the usual difference of a means test. In the total sample period (2002-2010), 20 percent of men and 14 percent of women were employed in the tradable sector. The differences in the employment rate in the tradable sectors between men and women are statistically significant, according to the variances of the means t-test.

Table 3. Main Results

	Domestic violence			Domestic violence	Domestic violence/population	Domestic violence	Domestic violence
	All jurisdictions	Rich jurisdictions	Poor jurisdictions	All jurisdictions	All jurisdictions	All jurisdictions	All jurisdictions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Ratio * RXR	0.0873 (0.0168) <i>p</i> =0.000 [0.0439] <i>p</i> =0.059	0.05000 (0.0361) <i>p</i> =0.166 [0.0167] <i>p</i> =0.020	0.1616 (0.0305) <i>p</i> =0.000 [0.0467] <i>p</i> =0.011	0.0813 (0.0173) <i>p</i> =0.000 [0.0439] <i>p</i> =0.092	0.0010 (0.0005) <i>p</i> =0.036 [0.0006] <i>p</i> =0.111	0.0982 (0.0417) <i>p</i> =0.020 [0.0539] <i>p</i> =0.082	0.0916 (0.0440) <i>p</i> =0.039 [0.0574] <i>p</i> =0.124
Per capita income				0.0002 (0.0001) <i>p</i> =0.039 [0.0002] <i>p</i> =0.430			0.0002 (0.0002) <i>p</i> =0.382 [0.0002] <i>p</i> =0.505
Observations	2592	864	864	2592	2592	216	216

Notes: RXR refers to real exchange rate. Ratio refers to the ratio of men to female participation in tradable sectors. A rich jurisdiction is one where the average per capita income is above the 66th percentile of the per capita income of the city in the first year of the sample. A poor jurisdiction is one where the average per capita income is below the 33rd percentile of the per capita income of the city in the first year of the sample. All models are estimated by OLS. Models (1) to (5) use monthly data and include month fixed effects and jurisdiction fixed effects. Model (6) and (7) use yearly data and include year fixed effects and jurisdiction fixed effects. Robust standard errors are in parentheses. Standard errors clustered at the jurisdiction level are in brackets; *p* refers to the *p*-value of each test.

Table 4. False Experiments

	Assaults	Assaults	Assaults
	(1)	(2)	(3)
Ratio * RXR	0.0218 (0.0219) <i>p</i> =0.320 [0.0409] <i>p</i> =0.599	0.0076 (0.0502) <i>p</i> =0.880 [0.0406] <i>p</i> =0.854	0.0545 (0.0521) <i>p</i> =0.296 [0.0504] <i>p</i> =0.290
Per capita income			-0.0011 (0.0003) <i>p</i> =0.001 [0.0005] <i>p</i> =0.034
Observations	2592	216	216

Notes: RXR refers to real exchange rate. Ratio refers to the ratio of men to female participation in tradable sectors. All models are estimated by OLS. Models (1) and (2) use monthly data and include month fixed effects and jurisdiction fixed effects. Model (3) uses yearly data and includes year fixed effects and jurisdiction fixed effects. Robust standard errors are in parentheses. Standard errors clustered at the jurisdiction level are in brackets; *p* refers to the p-value of each test.

Figure 1. Domestic Violence and the Real Exchange Rate

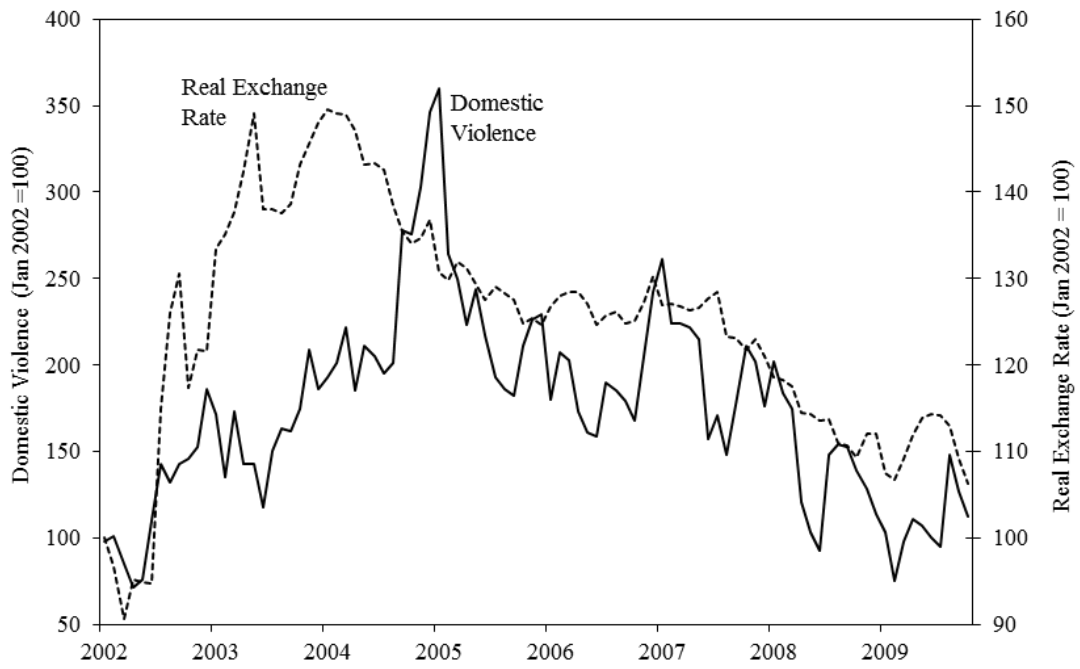
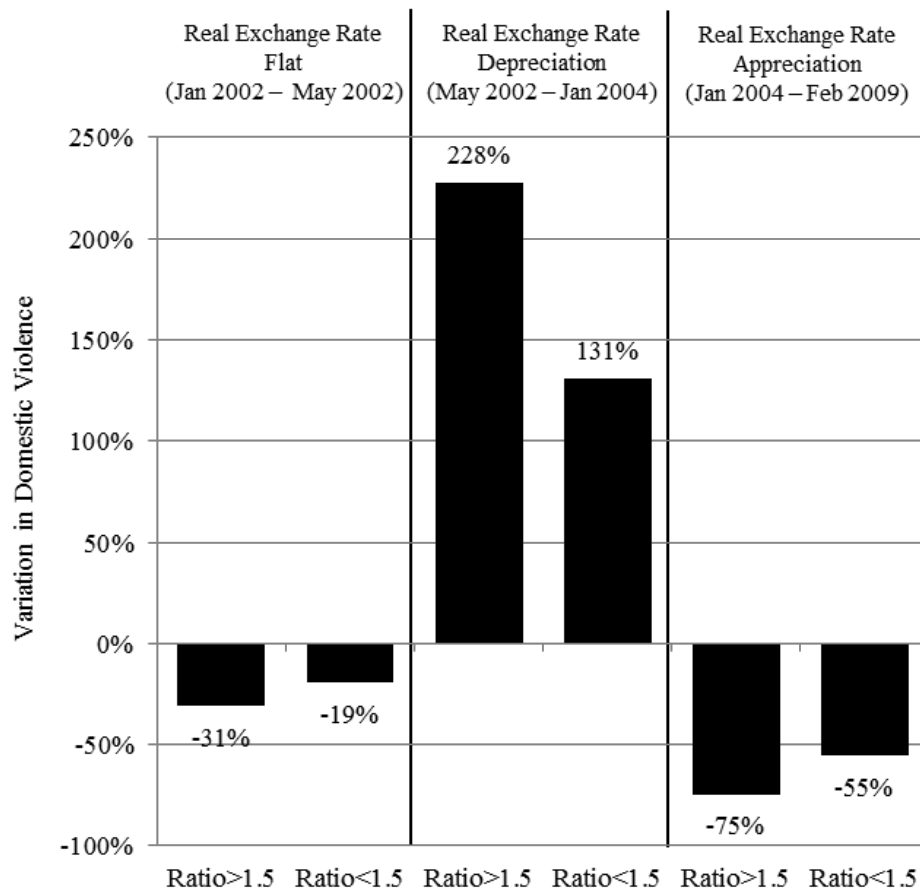


Figure 2. Real Exchange Rate Fluctuations, Relative Participation in Tradable Sectors, and Variation in Domestic Violence



Note: Ratio refers to the ratio of men to female participation in tradable sectors.